JMAP
REGENTS AT RANDOM

The NY Algebra 2/Trigonometry Regents Exams
Fall 2009-August 2015

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Algebra 2/Trigonometry Regents at Random

1 The value of csc 138°23′ rounded to four decimal places is
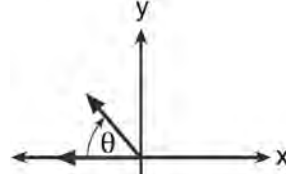   1) −1.3376
   2) −1.3408
   3) 1.5012
   4) 1.5057

2 The solution set of the equation $\sqrt{2x-4} = x-2$ is
   1) $\{-2,-4\}$
   2) $\{2,4\}$
   3) $\{4\}$
   4) $\{ \}$

3 Which expression is equivalent to $\dfrac{2x^{-2}y^{-2}}{4y^{-5}}$?
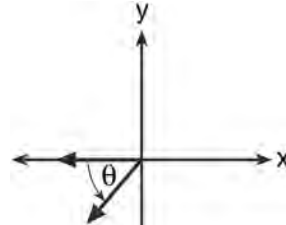
   1) $\dfrac{y^3}{2x^2}$

   2) $\dfrac{2y^3}{x^2}$

   3) $\dfrac{2x^2}{y^3}$

   4) $\dfrac{x^2}{2y^3}$
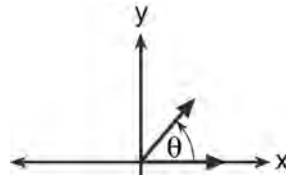
4 Solve $|-4x+5| < 13$ algebraically for x.

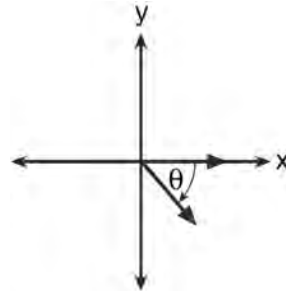5 If $m\angle\theta = -50$, which diagram represents θ drawn in standard position?

1)

2)

3)

4)

6 A population of rabbits doubles every 60 days according to the formula $P = 10(2)^{\frac{t}{60}}$, where P is the population of rabbits on day t. What is the value of t when the population is 320?
1) 240
2) 300
3) 660
4) 960

7 If $2x^3 = y$, then $\log y$ equals
1) $\log(2x) + \log 3$
2) $3 \log(2x)$
3) $3 \log 2 + 3 \log x$
4) $\log 2 + 3 \log x$

8 In $\triangle KLM$, $KL = 20$, $LM = 13$, and $m\angle K = 40$. The measure of $\angle M$?
1) must be between $0°$ and $90°$
2) must equal $90°$
3) must be between $90°$ and $180°$
4) is ambiguous

9 Theresa is comparing the graphs of $y = 2^x$ and $y = 5^x$. Which statement is true?
1) The y-intercept of $y = 2^x$ is $(0,2)$, and the y-intercept of $y = 5^x$ is $(0,5)$.
2) Both graphs have a y-intercept of $(0,1)$, and $y = 2^x$ is steeper for $x > 0$.
3) Both graphs have a y-intercept of $(0,1)$, and $y = 5^x$ is steeper for $x > 0$.
4) Neither graph has a y-intercept.

10 Expressed in simplest form, $\dfrac{3y}{2y-6} + \dfrac{9}{6-2y}$ is equivalent to
1) $\dfrac{-6y^2 + 36y - 54}{(2y-6)(6-2y)}$
2) $\dfrac{3y-9}{2y-6}$
3) $\dfrac{3}{2}$
4) $-\dfrac{3}{2}$

11 The relationship between t, a student's test scores, and d, the student's success in college, is modeled by the equation $d = 0.48t + 75.2$. Based on this linear regression model, the correlation coefficient could be
1) between -1 and 0
2) between 0 and 1
3) equal to -1
4) equal to 0

12 What is the common ratio of the sequence $\dfrac{1}{64} a^5 b^3, -\dfrac{3}{32} a^3 b^4, \dfrac{9}{16} ab^5, \ldots$?
1) $-\dfrac{3b}{2a^2}$
2) $-\dfrac{6b}{a^2}$
3) $-\dfrac{3a^2}{b}$
4) $-\dfrac{6a^2}{b}$

13 Perform the indicated operations and simplify completely:

$$\frac{x^3 - 3x^2 + 6x - 18}{x^2 - 4x} \cdot \frac{2x - 4}{x^4 - 3x^3} \div \frac{x^2 + 2x - 8}{16 - x^2}$$

14 For which value of k will the roots of the equation $2x^2 - 5x + k = 0$ be real and rational numbers?
1) 1
2) −5
3) 0
4) 4

15 As shown in the diagram below, fire-tracking station A is 100 miles due west of fire-tracking station B. A forest fire is spotted at F, on a bearing 47° northeast of station A and 15° northeast of station B. Determine, to the *nearest tenth of a mile*, the distance the fire is from *both* station A and station B. [N represents due north.]
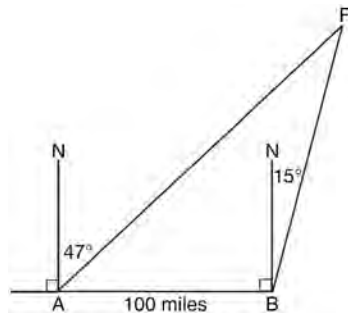

16 Express $\dfrac{\cot x \sin x}{\sec x}$ as a single trigonometric function, in simplest form, for all values of x for which it is defined.

17 Which ordered pair is a solution of the system of equations shown below? $x + y = 5$

$$(x + 3)^2 + (y - 3)^2 = 53$$

1) (2,3)
2) (5,0)
3) (−5,10)
4) (−4,9)

18 Liz has applied to a college that requires students to score in the top 6.7% on the mathematics portion of an aptitude test. The scores on the test are approximately normally distributed with a mean score of 576 and a standard deviation of 104. What is the minimum score Liz must earn to meet this requirement?
1) 680
2) 732
3) 740
4) 784

19 The diagram below shows the plans for a cell phone tower. A guy wire attached to the top of the tower makes an angle of 65 degrees with the ground. From a point on the ground 100 feet from the end of the guy wire, the angle of elevation to the top of the tower is 32 degrees. Find the height of the tower, to the *nearest foot*.

3
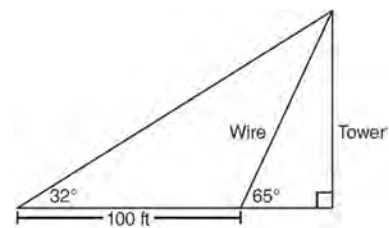
20 On the axes below, for $-2 \le x \le 2$, graph
$y = 2^{x+1} - 3$.
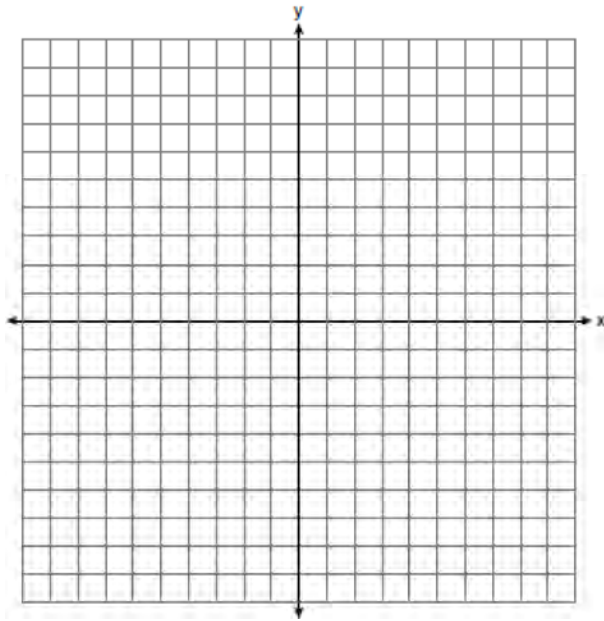
21 What is the solution set for $2\cos\theta - 1 = 0$ in the
interval $0° \le \theta < 360°$?
1) $\{30°, 150°\}$
2) $\{60°, 120°\}$
3) $\{30°, 330°\}$
4) $\{60°, 300°\}$

22 Which expression is equivalent to $(n \circ m \circ p)(x)$,
given $m(x) = \sin x$, $n(x) = 3x$, and $p(x) = x^2$?
1) $\sin(3x)^2$
2) $3\sin x^2$
3) $\sin^2(3x)$
4) $3\sin^2 x$

23 Max solves a quadratic equation by completing the
square. He shows a correct step:
$$(x+2)^2 = -9$$
What are the solutions to his equation?
1) $2 \pm 3i$
2) $-2 \pm 3i$
3) $3 \pm 2i$
4) $-3 \pm 2i$

24 The following is a list of the individual points
scored by all twelve members of the Webster High
School basketball team at a recent game:
2 2 3 4 6 7 9 10 10 11 12 14
Find the interquartile range for this set of data.

25 Which value of k satisfies the equation
$8^{3k+4} = 4^{2k-1}$?
1) -1
2) $-\dfrac{9}{4}$
3) -2
4) $-\dfrac{14}{5}$

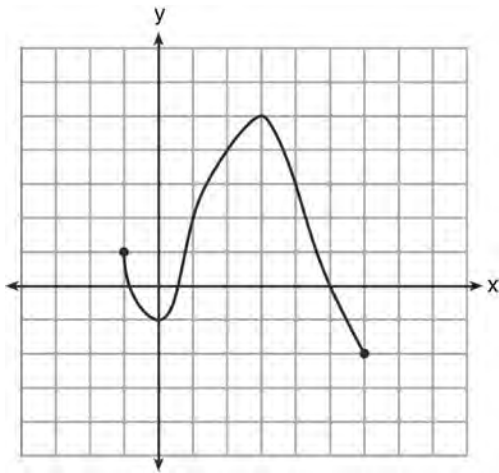26 If p varies inversely as q, and $p = 10$ when $q = \dfrac{3}{2}$,
what is the value of p when $q = \dfrac{3}{5}$?
1) 25
2) 15
3) 9
4) 4

4

27 Which expression is equivalent to $\dfrac{x^{-1}y^4}{3x^{-5}y^{-1}}$?

1) $\dfrac{x^4 y^5}{3}$

2) $\dfrac{x^5 y^4}{3}$

3) $3x^4 y^5$

4) $\dfrac{y^4}{3x^5}$

30 If $\sin A = -\dfrac{7}{25}$ and $\angle A$ terminates in Quadrant IV, $\tan A$ equals

1) $-\dfrac{7}{25}$

2) $-\dfrac{7}{24}$

3) $-\dfrac{24}{7}$

4) $-\dfrac{24}{25}$

28 What is the domain of the function shown below?

1) $-1 \le x \le 6$
2) $-1 \le y \le 6$
3) $-2 \le x \le 5$
4) $-2 \le y \le 5$

31 What is the graph of the solution set of $|2x - 1| > 5$?

29 Expressed in simplest form, $\sqrt{-18} - \sqrt{-32}$ is

1) $-\sqrt{2}$
2) $-7\sqrt{2}$
3) $-i\sqrt{2}$
4) $7i\sqrt{2}$

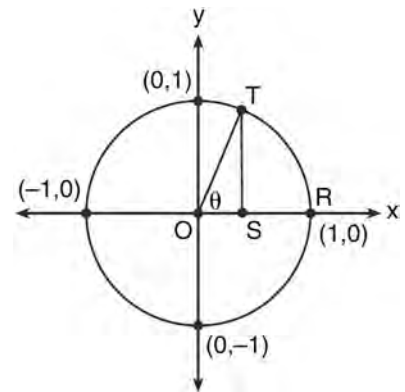32 In the diagram below, the length of which line segment is equal to the exact value of $\sin \theta$?

1) $\overline{TO}$
2) $\overline{TS}$
3) $\overline{OR}$
4) $\overline{OS}$

33 Which graph represents the function $\log_2 x = y$?

1)

(1,0)

2)

(0,2)

3)

(1,0)

4)

(2,0)
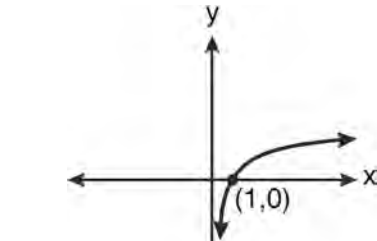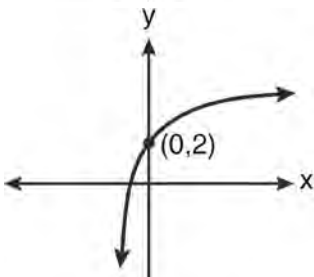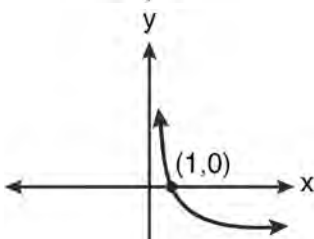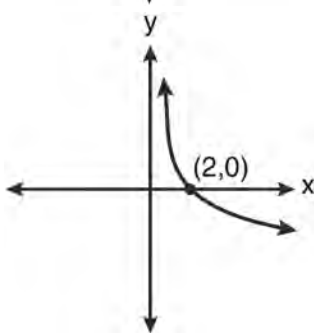
34 Find the solution of the inequality $x^2 - 4x > 5$, algebraically.

35 If $g(x) = \left(ax\sqrt{1-x} \right)^2$, express $g(10)$ in simplest form.

36 If $\log x^2 - \log 2a = \log 3a$, then $\log x$ expressed in terms of $\log a$ is equivalent to

1) $\frac{1}{2} \log 5a$

2) $\frac{1}{2} \log 6 + \log a$

3) $\log 6 + \log a$

4) $\log 6 + 2 \log a$

37 If $\log_4 x = 2.5$ and $\log_y 125 = -\frac{3}{2}$, find the numerical value of $\frac{x}{y}$, in simplest form.

38 Solve the equation $6x^2 - 2x - 3 = 0$ and express the answer in simplest radical form.

39 When $x^{-1} + 1$ is divided by $x + 1$, the quotient equals

1) 1

2) $\frac{1}{x}$

3) x

4) $-\frac{1}{x}$

40 A spinner is divided into eight equal sections. Five sections are red and three are green. If the spinner is spun three times, what is the probability that it lands on red *exactly* twice?

1) $\dfrac{25}{64}$

2) $\dfrac{45}{512}$

3) $\dfrac{75}{512}$

4) $\dfrac{225}{512}$

41 If $f(x) = 4x - x^2$ and $g(x) = \dfrac{1}{x}$, then $(f \circ g)\left(\dfrac{1}{2}\right)$ is equal to

1) $\dfrac{4}{7}$

2) -2

3) $\dfrac{7}{2}$

4) 4

42 Solve algebraically for all values of x:

$\log_{(x+4)}(17x - 4) = 2$

43 The value of $\sin(180 + x)$ is equivalent to

1) $-\sin x$
2) $-\sin(90 - x)$
3) $\sin x$
4) $\sin(90 - x)$

44 What are the sum and product of the roots of the equation $6x^2 - 4x - 12 = 0$?

1) $\text{sum} = -\dfrac{2}{3}$; $\text{product} = -2$

2) $\text{sum} = \dfrac{2}{3}$; $\text{product} = -2$

3) $\text{sum} = -2$; $\text{product} = \dfrac{2}{3}$

4) $\text{sum} = -2$; $\text{product} = -\dfrac{2}{3}$

45 If $f(x) = \sqrt{9 - x^2}$, what are its domain and range?

1) domain: $\{x \mid -3 \le x \le 3\}$; range: $\{y \mid 0 \le y \le 3\}$
2) domain: $\{x \mid x \ne \pm 3\}$; range: $\{y \mid 0 \le y \le 3\}$
3) domain: $\{x \mid x \le -3 \text{ or } x \ge 3\}$; range: $\{y \mid y \ne 0\}$
4) domain: $\{x \mid x \ne 3\}$; range: $\{y \mid y \ge 0\}$

46 If $g(x) = \dfrac{1}{2}x + 8$ and $h(x) = \dfrac{1}{2}x - 2$, what is the value of $g(h(-8))$?

1) 0
2) 9
3) 5
4) 4

47 What is the solution set of the equation $3x^5 - 48x = 0$?

1) $\{0, \pm 2\}$
2) $\{0, \pm 2, 3\}$
3) $\{0, \pm 2, \pm 2i\}$
4) $\{\pm 2, \pm 2i\}$

48 Evaluate: $\sum_{n=1}^{3}(-n^4 - n)$

49 Convert 3 radians to degrees and express the answer to the *nearest minute*.

50 The conjugate of the complex expression $-5x + 4i$ is
1) $5x - 4i$
2) $5x + 4i$
3) $-5x - 4i$
4) $-5x + 4i$

51 Whenever Sara rents a movie, the probability that it is a horror movie is 0.57. Of the next five movies she rents, determine the probability, to the *nearest hundredth*, that *no more than* two of these rentals are horror movies.

52 The table below shows the concentration of ozone in Earth's atmosphere at different altitudes. Write the exponential regression equation that models these data, rounding *all* values to the *nearest thousandth*.

Concentration of Ozone

Altitude (x)	Ozone Units (y)
0	0.7
5	0.6
10	1.1
15	3.0
20	4.9

53 Which is a graph of $y = \cot x$?
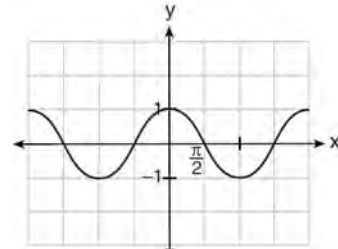
1)
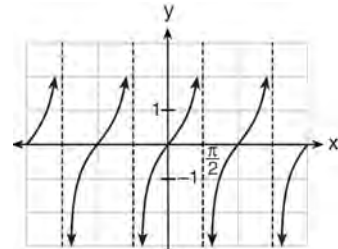
2)
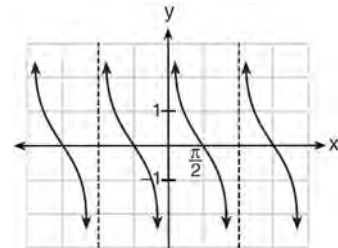
3)
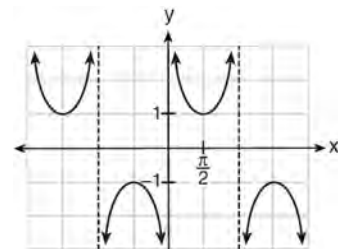
4)

54 Which statement about the graph of the equation $y = e^x$ is *not* true?
1) It is asymptotic to the *x*-axis.
2) The domain is the set of all real numbers.
3) It lies in Quadrants I and II.
4) It passes through the point $(e, 1)$.

55 What is the product of $\left(\dfrac{2}{5}x - \dfrac{3}{4}y^2 \right)$ and $\left(\dfrac{2}{5}x + \dfrac{3}{4}y^2 \right)$?

1) $\dfrac{4}{25}x^2 - \dfrac{9}{16}y^4$

2) $\dfrac{4}{25}x - \dfrac{9}{16}y^2$

3) $\dfrac{2}{5}x^2 - \dfrac{3}{4}y^4$

4) $\dfrac{4}{5}x$

56 The expression $\left(\sqrt[3]{27x^2} \right)\left(\sqrt[3]{16x^4} \right)$ is equivalent to

1) $12x^2\sqrt[3]{2}$

2) $12x\sqrt[3]{2x}$

3) $6x\sqrt[3]{2x^2}$

4) $6x^2\sqrt[3]{2}$

57 If $\sin A = \dfrac{1}{3}$, what is the value of $\cos 2A$?

1) $-\dfrac{2}{3}$

2) $\dfrac{2}{3}$

3) $-\dfrac{7}{9}$

4) $\dfrac{7}{9}$

58 If $f(x) = 2x^2 - 3x + 1$ and $g(x) = x + 5$, what is $f(g(x))$?

1) $2x^2 + 17x + 36$

2) $2x^2 + 17x + 66$

3) $2x^2 - 3x + 6$

4) $2x^2 - 3x + 36$

59 The data collected by a biologist showing the growth of a colony of bacteria at the end of each hour are displayed in the table below.

Time, hour, (x)	Population (y)
0	250
1	330
2	580
3	800
4	1650
5	3000

Write an exponential regression equation to model these data. Round all values to the *nearest thousandth*. Assuming this trend continues, use this equation to estimate, to the nearest *ten*, the number of bacteria in the colony at the end of 7 hours.

60 A circle is drawn to represent a pizza with a 12 inch diameter. The circle is cut into eight congruent pieces. What is the length of the outer edge of any one piece of this circle?

1) $\dfrac{3\pi}{4}$

2) π

3) $\dfrac{3\pi}{2}$

4) 3π

61 Given the relation $\{(8,2),(3,6),(7,5),(k,4)\}$, which value of k will result in the relation *not* being a function?
1) 1
2) 2
3) 3
4) 4

62 Which diagram represents a relation that is both one-to-one and onto?

1)

2)

3)

4)
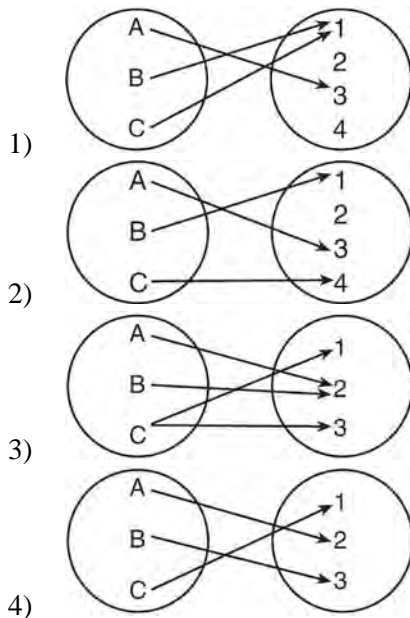
63 Which expression, when rounded to three decimal places, is equal to −1.155?
1) $\sec\left(\dfrac{5\pi}{6}\right)$
2) $\tan(49°20')$
3) $\sin\left(-\dfrac{3\pi}{5}\right)$
4) $\csc(-118°)$

64 Solve algebraically for x: $4 - \sqrt{2x - 5} = 1$

65 The expression $\dfrac{1}{7 - \sqrt{11}}$ is equivalent to
1) $\dfrac{7 + \sqrt{11}}{38}$
2) $\dfrac{7 - \sqrt{11}}{38}$
3) $\dfrac{7 + \sqrt{11}}{60}$
4) $\dfrac{7 - \sqrt{11}}{60}$

66 What is the number of degrees in an angle whose measure is 2 radians?
1) $\dfrac{360}{\pi}$
2) $\dfrac{\pi}{360}$
3) 360
4) 90

67 Ten teams competed in a cheerleading competition at a local high school. Their scores were 29, 28, 39, 37, 45, 40, 41, 38, 37, and 48. How many scores are within one population standard deviation from the mean? For these data, what is the interquartile range?

68 Approximately how many degrees does five radians equal?
1) 286
2) 900
3) $\dfrac{\pi}{36}$
4) 5π

69 Solve algebraically for all values of x:

$$81^{x^3 + 2x^2} = 27^{\frac{5x}{3}}$$

70 What is the range of $f(x) = |x - 3| + 2$?
1) $\{x \mid x \geq 3\}$
2) $\{y \mid y \geq 2\}$
3) $\{x \mid x \in \text{real numbers}\}$
4) $\{y \mid y \in \text{real numbers}\}$

71 Given $\triangle ABC$ with $a = 9$, $b = 10$, and $m\angle B = 70$, what type of triangle can be drawn?
1) an acute triangle, only
2) an obtuse triangle, only
3) both an acute triangle and an obtuse triangle
4) neither an acute triangle nor an obtuse triangle

72 If $\sin \theta < 0$ and $\cot \theta > 0$, in which quadrant does the terminal side of angle θ lie?
1) I
2) II
3) III
4) IV

73 Multiply $x + yi$ by its conjugate, and express the product in simplest form.

74 What is the equation of the graph shown below?

(0,1)
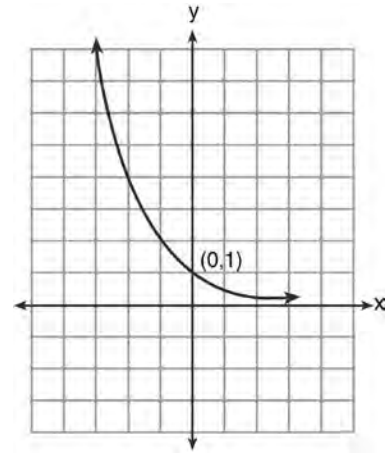
1) $y = 2^x$
2) $y = 2^{-x}$
3) $x = 2^y$
4) $x = 2^{-y}$

75 What is the product of $\left(\dfrac{x}{4} - \dfrac{1}{3}\right)$ and $\left(\dfrac{x}{4} + \dfrac{1}{3}\right)$?
1) $\dfrac{x^2}{8} - \dfrac{1}{9}$
2) $\dfrac{x^2}{16} - \dfrac{1}{9}$
3) $\dfrac{x^2}{8} - \dfrac{x}{6} - \dfrac{1}{9}$
4) $\dfrac{x^2}{16} - \dfrac{x}{6} - \dfrac{1}{9}$

11

76 The number of bacteria present in a Petri dish can be modeled by the function $N = 50e^{3t}$, where N is the number of bacteria present in the Petri dish after t hours. Using this model, determine, to the *nearest hundredth*, the number of hours it will take for N to reach 30,700.

77 If d varies inversely as t, and $d = 20$ when $t = 2$, what is the value of t when $d = -5$?
1) 8
2) 2
3) -8
4) -2

78 What is the solution set for the equation $\sqrt{5x + 29} = x + 3$?
1) {4}
2) {-5}
3) {4,5}
4) {-5,4}

79 Which expression represents the third term in the expansion of $(2x^4 - y)^3$?
1) $-y^3$
2) $-6x^4y^2$
3) $6x^4y^2$
4) $2x^4y^2$

80 Solve the equation below algebraically, and express the result in simplest radical form:
$$\frac{13}{x} = 10 - x$$

81 In $\triangle PQR$, p equals
1) $\dfrac{r\sin P}{\sin Q}$
2) $\dfrac{r\sin P}{\sin R}$
3) $\dfrac{r\sin R}{\sin P}$
4) $\dfrac{q\sin R}{\sin Q}$

82 Solve algebraically for all values of x:
$$x^4 + 4x^3 + 4x^2 = -16x$$

83 A cliff diver on a Caribbean island jumps from a height of 105 feet, with an initial upward velocity of 5 feet per second. An equation that models the height, h(t), above the water, in feet, of the diver in ti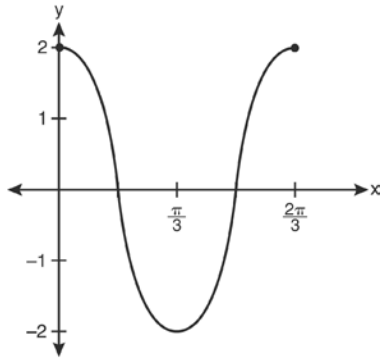me elapsed, t, in seconds, is h(t) $= -16t^2 + 5t + 105$. How many seconds, to the *nearest hundredth*, does it take the diver to fall 45 feet below his starting point?
1) 1.45
2) 1.84
3) 2.10
4) 2.72

84 If $\log 2 = a$ and $\log 3 = b$, the expression $\log \dfrac{9}{20}$ is equivalent to
1) $2b - a + 1$
2) $2b - a - 1$
3) $b^2 - a + 10$
4) $\dfrac{2b}{a + 1}$

85 Which equation is represented by the graph below?

1) $y = 2\cos 3x$
2) $y = 2\sin 3x$
3) $y = 2\cos \dfrac{2\pi}{3} x$
4) $y = 2\sin \dfrac{2\pi}{3} x$

86 What is the number of degrees in an angle whose radian measure is $\dfrac{8\pi}{5}$?

1) 576
2) 288
3) 225
4) 113

87 How many different six-letter arrangements can be made using the letters of the word "TATTOO"?
1) 60
2) 90
3) 120
4) 720

88 Express $4xi + 5yi^8 + 6xi^3 + 2yi^4$ in simplest $a + bi$ form.

89 A population of single-celled organisms was grown in a Petri dish over a period of 16 hours. The number of organisms at a given time is recorded in the table below.

Time, hrs (x)	Number of Organisms (y)
0	25
2	36
4	52
6	68
8	85
10	104
12	142
16	260

Determine the exponential regression equation model for these data, rounding all values to the *nearest ten-thousandth*. Using this equation, predict the number of single-celled organisms, to the *nearest whole number*, at the end of the 18th hour.

90 The table below displays the results of a survey regarding the number of pets each student in a class has. The average number of pets per student in this class is 2.

Number of Pets	0	1	2	3	4	5
Number of Students	4	6	10	0	k	2

What is the value of k for this table?
1) 9
2) 2
3) 8
4) 4

91 What are the coordinates of the center of a circle whose equation is $x^2 + y^2 - 16x + 6y + 53 = 0$?
1) $(-8,-3)$
2) $(-8,3)$
3) $(8,-3)$
4) $(8,3)$

92 When factored completely, the expression $3x^3 - 5x^2 - 48x + 80$ is equivalent to
1) $(x^2 - 16)(3x - 5)$
2) $(x^2 + 16)(3x - 5)(3x + 5)$
3) $(x + 4)(x - 4)(3x - 5)$
4) $(x + 4)(x - 4)(3x - 5)(3x - 5)$

93 What is the solution set of the equation
$$\frac{30}{x^2 - 9} + 1 = \frac{5}{x - 3}?$$
1) $\{2,3\}$
2) $\{2\}$
3) $\{3\}$
4) $\{\ \}$

94 Convert 2.5 radians to degrees, and express the answer to the *nearest minute*.

95 Which statement regarding the inverse function is true?
1) A domain of $y = \sin^{-1} x$ is $[0, 2\pi]$.
2) The range of $y = \sin^{-1} x$ is $[-1, 1]$.
3) A domain of $y = \cos^{-1} x$ is $(-\infty, \infty)$.
4) The range of $y = \cos^{-1} x$ is $[0, \pi]$.

96 Which equation is represented by the graph below?
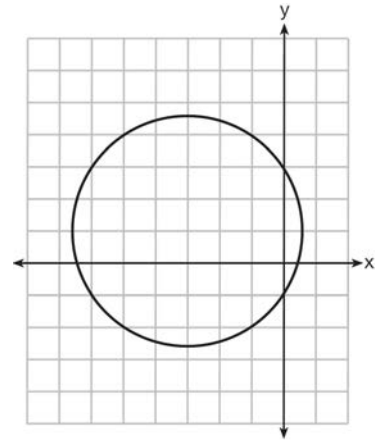
1) $(x - 3)^2 + (y + 1)^2 = 5$
2) $(x + 3)^2 + (y - 1)^2 = 5$
3) $(x - 1)^2 + (y + 3)^2 = 13$
4) $(x + 3)^2 + (y - 1)^2 = 13$

97 Which problem involves evaluating $_6P_4$?
1) How many different four-digit ID numbers can be formed using 1, 2, 3, 4, 5, and 6 without repetition?
2) How many different subcommittees of four can be chosen from a committee having six members?
3) How many different outfits can be made using six shirts and four pairs of pants?
4) How many different ways can one boy and one girl be selected from a group of four boys and six girls?

98 Express the product of cos 30° and sin 45° in simplest radical form.

14

99 The expression $(2a)^{-4}$ is equivalent to
1) $-8a^4$
2) $\dfrac{16}{a^4}$
3) $-\dfrac{2}{a^4}$
4) $\dfrac{1}{16a^4}$

100 During a particular month, a local company surveyed all its employees to determine their travel times to work, in minutes. The data for all 15 employees are shown below.

$$25 \quad 55 \quad 40 \quad 65 \quad 29$$
$$45 \quad 59 \quad 35 \quad 25 \quad 37$$
$$52 \quad 30 \quad 8 \quad 40 \quad 55$$

Determine the number of employees whose travel time is within one standard deviation of the mean.

101 What is the period of the graph $y = \dfrac{1}{2}\sin 6x$?

1) $\dfrac{\pi}{6}$
2) $\dfrac{\pi}{3}$
3) $\dfrac{\pi}{2}$
4) 6π

102 Determine the value of n in simplest form:
$$i^{13} + i^{18} + i^{31} + n = 0$$

103 The sum of $\sqrt[3]{6a^4 b^2}$ and $\sqrt[3]{162a^4 b^2}$, expressed in simplest radical form, is
1) $\sqrt[6]{168a^8 b^4}$
2) $2a^2 b\sqrt[3]{21a^2 b}$
3) $4a\sqrt[3]{6ab^2}$
4) $10a^2 b\sqrt[3]{8}$

104 Write an equation for the graph of the trigonometric function shown below.
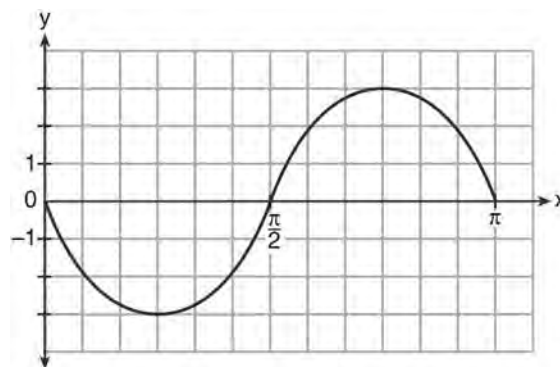
105 Two forces of 40 pounds and 28 pounds act on an object. The angle between the two forces is 65°. Find the magnitude of the resultant force, to the *nearest pound*. Using this answer, find the measure of the angle formed between the resultant and the *smaller* force, to the *nearest degree*.

106 In $\triangle DEF$, $d = 5$, $e = 8$, and $m\angle D = 32$. How many distinct triangles can be drawn given these measurements?
1) 1
2) 2
3) 3
4) 0

15
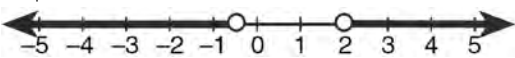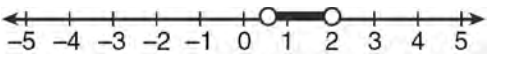
107 What is the solution set of the equation $-\sqrt{2}\sec x = 2$ when $0° \le x < 360°$?
1) $\{45°, 135°, 225°, 315°\}$
2) $\{45°, 315°\}$
3) $\{135°, 225°\}$
4) $\{225°, 315°\}$

108 Which graph represents the solution set of $\left|\dfrac{4x-5}{3}\right| > 1$?

1)
2)
3)
4)

109 A sequence has the following terms: $a_1 = 4$, $a_2 = 10$, $a_3 = 25$, $a_4 = 62.5$. Which formula represents the nth term in the sequence?
1) $a_n = 4 + 2.5n$
2) $a_n = 4 + 2.5(n-1)$
3) $a_n = 4(2.5)^n$
4) $a_n = 4(2.5)^{n-1}$

110 Find, to the *nearest tenth of a square foot*, the area of a rhombus that has a side of 6 feet and an angle of 50°.
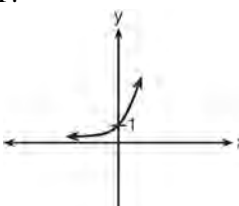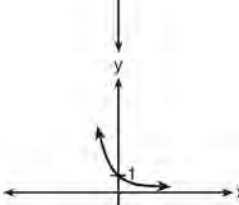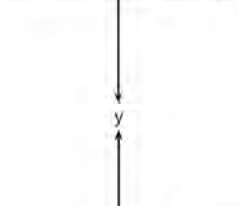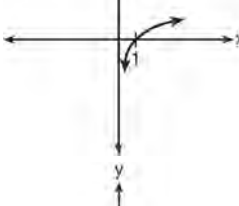
111 Which ordered pair is in the solution set of the system of equations shown below?
$$y^2 - x^2 + 32 = 0$$
$$3y - x = 0$$
1) $(2,6)$
2) $(3,1)$
3) $(-1,-3)$
4) $(-6,-2)$

112 Which sketch shows the inverse of $y = a^x$, where $a > 1$?

1)
2)
3)
4)

113 If \$5000 is invested at a rate of 3% interest compounded quarterly, what is the value of the investment in 5 years? (Use the formula

$$A = P\left(1 + \frac{r}{n}\right)^{nt}$$, where A is the amount accrued, P

is the principal, r is the interest rate, n is the number of times per year the money is compounded, and t is the length of time, in years.)
1) \$5190.33
2) \$5796.37
3) \$5805.92
4) \$5808.08

114 Find, to the *nearest tenth*, the radian measure of 216°.

115 What is the product of the roots of $x^2 - 4x + k = 0$ if one of the roots is 7?
1) 21
2) −11
3) −21
4) −77

116 If $\log_b x = 3\log_b p - \left(2\log_b t + \frac{1}{2}\log_b r\right)$, then the

value of x is

1) $\dfrac{p^3}{\sqrt{t^2 r}}$

2) $p^3 t^2 r^{\frac{1}{2}}$

3) $\dfrac{p^3 t^2}{\sqrt{r}}$

4) $\dfrac{p^3}{t^2 \sqrt{r}}$

117 In which interval of $f(x) = \cos(x)$ is the inverse also a function?
1) $-\dfrac{\pi}{2} < x < \dfrac{\pi}{2}$

2) $-\dfrac{\pi}{2} \le x \le \dfrac{\pi}{2}$

3) $0 \le x \le \pi$

4) $\dfrac{\pi}{2} \le x \le \dfrac{3\pi}{2}$

118 Which graph represents the solution set of

$$\frac{x+16}{x-2} \le 7?$$

1)
2)
3)
4)
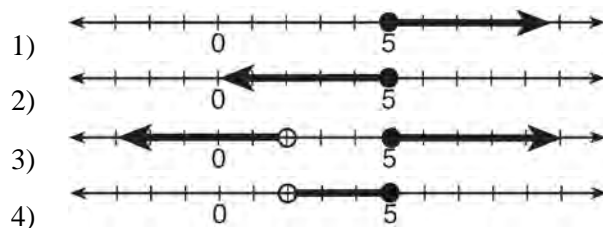
119 There are eight people in a tennis club. Which expression can be used to find the number of different ways they can place first, second, and third in a tournament?
1) $_8P_3$
2) $_8C_3$
3) $_8P_5$
4) $_8C_5$

120 Find, algebraically, the measure of the obtuse angle, to the *nearest degree*, that satisfies the equation $5\csc\theta = 8$.

17

121 Which equation represents the graph below?
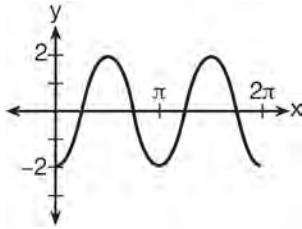
1) $y = -2\sin 2x$

2) $y = -2\sin\frac{1}{2}x$

3) $y = -2\cos 2x$

4) $y = -2\cos\frac{1}{2}x$

122 The formula for continuously compounded interest is $A = Pe^{rt}$, where A is the amount of money in the account, P is the initial investment, r is the interest rate, and t is the time in years. Using the formula, determine, to the *nearest dollar*, the amount in the account after 8 years if $750 is invested at an annual rate of 3%.

123 A ranch in the Australian Outback is shaped like triangle ACE, with $m\angle A = 42$, $m\angle E = 103$, and $AC = 15$ miles. Find the area of the ranch, to the *nearest square mile*.

124 The two sides and included angle of a parallelogram are 18, 22, and 60°. Find its exact area in simplest form.

125 In a certain school, the heights of the population of girls are normally distributed, with a mean of 63 inches and a standard deviation of 2 inches. If there are 450 girls in the school, determine how many of the girls are *shorter than* 60 inches. Round the answer to the *nearest integer*.

126 Show that $\sec\theta\sin\theta\cot\theta = 1$ is an identity.

127 What is the common difference of the arithmetic sequence below?
$$-7x, -4x, -x, 2x, 5x, \ldots$$

1) -3

2) $-3x$

3) 3

4) $3x$

128 Which function is one-to-one?

1) $k(x) = x^2 + 2$

2) $g(x) = x^3 + 2$

3) $f(x) = |x| + 2$

4) $j(x) = x^4 + 2$

129 Which step can be used when solving $x^2 - 6x - 25 = 0$ by completing the square?

1) $x^2 - 6x + 9 = 25 + 9$

2) $x^2 - 6x - 9 = 25 - 9$

3) $x^2 - 6x + 36 = 25 + 36$

4) $x^2 - 6x - 36 = 25 - 36$

130 Find the number of possible different 10-letter arrangements using the letters of the word "STATISTICS."

131 The roots of the equation $2x^2 + 4 = 9x$ are
   1) real, rational, and equal
   2) real, rational, and unequal
   3) real, irrational, and unequal
   4) imaginary

132 Two sides of a triangular-shaped sandbox measure 22 feet and 13 feet. If the angle between these two sides measures 55°, what is the area of the sandbox, to the *nearest square foot*?
   1) 82
   2) 117
   3) 143
   4) 234

133 If order does *not* matter, which selection of students would produce the most possible committees?
   1) 5 out of 15
   2) 5 out of 25
   3) 20 out of 25
   4) 15 out of 25

134 What is the sum of the first 19 terms of the sequence $3, 10, 17, 24, 31, \ldots$?
   1) 1188
   2) 1197
   3) 1254
   4) 1292

135 A school cafeteria has five different lunch periods. The cafeteria staff wants to find out which items on the menu are most popular, so they give every student in the first lunch period a list of questions to answer in order to collect data to represent the school. Which type of study does this represent?
   1) observation
   2) controlled experiment
   3) population survey
   4) sample survey

136 The graph below shows the average price of gasoline, in dollars, for the years 1997 to 2007.
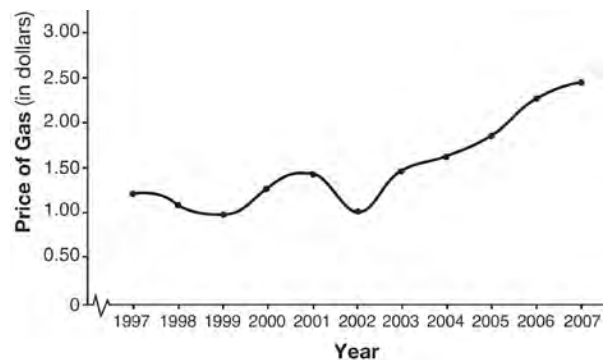
What is the approximate range of this graph?
   1) $1997 \le x \le 2007$
   2) $1999 \le x \le 2007$
   3) $0.97 \le y \le 2.38$
   4) $1.27 \le y \le 2.38$

137 How many negative solutions to the equation $2x^3 - 4x^2 + 3x - 1 = 0$ exist?
   1) 1
   2) 2
   3) 3
   4) 0

138 The function f(x) is graphed on the set of axes below. On the same set of axes, graph $f(x+1)+2$.
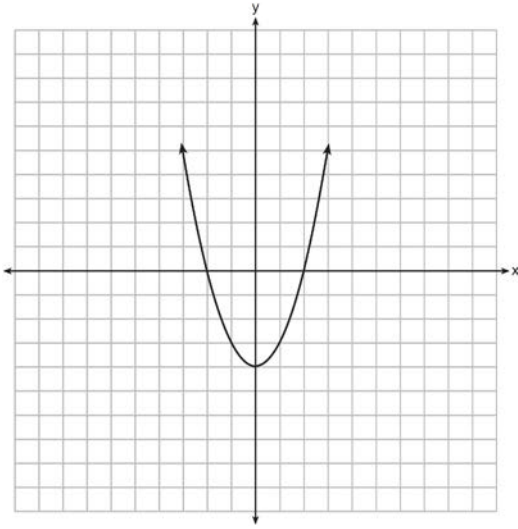
139 Express in simplest form: $\dfrac{\dfrac{4-x^2}{x^2+7x+12}}{\dfrac{2x-4}{x+3}}$

140 The expression $\dfrac{a+\dfrac{b}{c}}{d-\dfrac{b}{c}}$ is equivalent to

1) $\dfrac{c+1}{d-1}$

2) $\dfrac{a+b}{d-b}$

3) $\dfrac{ac+b}{cd-b}$

4) $\dfrac{ac+1}{cd-1}$

141 The expression $4+\sum\limits_{k=2}^{5}3(k-x)$ is equal to

1) $58-4x$
2) $46-4x$
3) $58-12x$
4) $46-12x$

142 Which summation represents $5+7+9+11+\ldots+43$?

1) $\sum\limits_{n=5}^{43} n$

2) $\sum\limits_{n=1}^{20}(2n+3)$

3) $\sum\limits_{n=4}^{24}(2n-3)$

4) $\sum\limits_{n=3}^{23}(3n-4)$

143 Solve algebraically for x:
$$\sqrt{x^2+x-1}+11x=7x+3$$

144 Which expression is equivalent to $\sum\limits_{n=1}^{4}(a-n)^2$?

1) $2a^2+17$
2) $4a^2+30$
3) $2a^2-10a+17$
4) $4a^2-20a+30$

20

145 A cup of soup is left on a countertop to cool. The table below gives the temperatures, in degrees Fahrenheit, of the soup recorded over a 10-minute period.

Time in Minutes (x)	Temperature in ^{o}F (y)
0	180.2
2	165.8
4	146.3
6	135.4
8	127.7
10	110.5

Write an exponential regression equation for the data, rounding all values to the *nearest thousandth.*

146 A study finds that 80% of the local high school students text while doing homework. Ten students are selected at random from the local high school. Which expression would be part of the process used to determine the probability that, *at most*, 7 of the 10 students text while doing homework?

1) $_{10}C_6\left(\frac{4}{5}\right)^6\left(\frac{1}{5}\right)^4$

2) $_{10}C_7\left(\frac{4}{5}\right)^{10}\left(\frac{1}{5}\right)^7$

3) $_{10}C_8\left(\frac{7}{10}\right)^{10}\left(\frac{3}{10}\right)^2$

4) $_{10}C_9\left(\frac{7}{10}\right)^9\left(\frac{3}{10}\right)^1$

147 The area of triangle ABC is 42. If $AB = 8$ and $m\angle B = 61$, the length of $\overline{BC}$ is approximately
1) 5.1
2) 9.2
3) 12.0
4) 21.7

148 The quantities p and q vary inversely. If $p = 20$ when $q = -2$, and $p = x$ when $q = -2x + 2$, then x equals
1) −4 and 5
2) $\frac{20}{19}$
3) −5 and 4
4) $-\frac{1}{4}$

149 In the right triangle shown below, what is the measure of angle S, to the *nearest minute?*
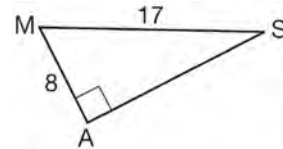
1) 28°1'
2) 28°4'
3) 61°56'
4) 61°93'

150 What is the middle term in the expansion of $\left(\frac{x}{2} - 2y\right)^6$?

1) $20x^3y^3$
2) $-\frac{15}{4}x^4y^2$
3) $-20x^3y^3$
4) $\frac{15}{4}x^4y^2$

151 Which equation has roots with the sum equal to $\frac{9}{4}$

and the product equal to $\frac{3}{4}$?

1) $4x^2 + 9x + 3 = 0$
2) $4x^2 + 9x - 3 = 0$
3) $4x^2 - 9x + 3 = 0$
4) $4x^2 - 9x - 3 = 0$

152 For $y = \dfrac{3}{\sqrt{x-4}}$, what are the domain and range?

1) $\{x \mid x > 4\}$ and $\{y \mid y > 0\}$
2) $\{x \mid x \geq 4\}$ and $\{y \mid y > 0\}$
3) $\{x \mid x > 4\}$ and $\{y \mid y \geq 0\}$
4) $\{x \mid x \geq 4\}$ and $\{y \mid y \geq 0\}$

153 The expression $\log 4m^2$ is equivalent to

1) $2(\log 4 + \log m)$
2) $2\log 4 + \log m$
3) $\log 4 + 2\log m$
4) $\log 16 + 2\log m$

154 The formula to determine continuously compounded interest is $A = Pe^{rt}$, where A is the amount of money in the account, P is the initial investment, r is the interest rate, and t is the time, in years. Which equation could be used to determine the value of an account with an $18,000 initial investment, at an interest rate of 1.25% for 24 months?

1) $A = 18,000e^{1.25 \cdot 2}$
2) $A = 18,000e^{1.25 \cdot 24}$
3) $A = 18,000e^{0.0125 \cdot 2}$
4) $A = 18,000e^{0.0125 \cdot 24}$

155 Which calculator output shows the strongest linear relationship between x and y?

1)   Lin Reg
     $y = a + bx$
     $a = 59.026$
     $b = 6.767$
     $r = .8643$

2)   Lin Reg
     $y = a + bx$
     $a = .7$
     $b = 24.2$
     $r = .8361$

3)   Lin Reg
     $y = a + bx$
     $a = 2.45$
     $b = .95$
     $r = .6022$

4)   Lin Reg
     $y = a + bx$
     $a = -2.9$
     $b = 24.1$
     $r = -.8924$

156 In the interval $0° \leq x < 360°$, $\tan x$ is undefined when x equals

1) $0°$ and $90°$
2) $90°$ and $180°$
3) $180°$ and $270°$
4) $90°$ and $270°$

157 Solve algebraically for x: $\log_{5x-1} 4 = \dfrac{1}{3}$

158 Determine the sum and the product of the roots of the equation $12x^2 + x - 6 = 0$.

159 Which value of r represents data with a strong positive linear correlation between two variables?
1) 0.89
2) 0.34
3) 1.04
4) 0.01

160 If n is a negative integer, then which statement is always true?
1) $6n^{-2} < 4n^{-1}$
2) $\dfrac{n}{4} > -6n^{-1}$
3) $6n^{-1} < 4n^{-1}$
4) $4n^{-1} > (6n)^{-1}$

161 In an arithmetic sequence, $a_4 = 19$ and $a_7 = 31$. Determine a formula for a_n, the nth term of this sequence.

162 When $x^2 + 3x - 4$ is subtracted from $x^3 + 3x^2 - 2x$, the difference is
1) $x^3 + 2x^2 - 5x + 4$
2) $x^3 + 2x^2 + x - 4$
3) $-x^3 + 4x^2 + x - 4$
4) $-x^3 - 2x^2 + 5x + 4$

163 The measures of the angles between the resultant and two applied forces are 60° and 45°, and the magnitude of the resultant is 27 pounds. Find, to the *nearest pound*, the magnitude of each applied force.

164 Solve $|2x - 3| > 5$ algebraically.

165 As shown in the table below, a person's target heart rate during exercise changes as the person gets older.

Age (years)	Target Heart Rate (beats per minute)
20	135
25	132
30	129
35	125
40	122
45	119
50	115

Which value represents the linear correlation coefficient, rounded to the *nearest thousandth*, between a person's age, in years, and that person's target heart rate, in beats per minute?
1) −0.999
2) −0.664
3) 0.998
4) 1.503

166 If $\sin x = \sin y = a$ and $\cos x = \cos y = b$, then $\cos(x - y)$ is
1) $b^2 - a^2$
2) $b^2 + a^2$
3) $2b - 2a$
4) $2b + 2a$

167 Solve $x^3 + 5x^2 = 4x + 20$ algebraically.

23

168 The sum of the first eight terms of the series
$3 - 12 + 48 - 192 + \ldots$ is
1) $-13,107$
2) $-21,845$
3) $-39,321$
4) $-65,535$

169 Solve algebraically for x: $\log_{27}(2x - 1) = \dfrac{4}{3}$

170 If $\sec(a + 15)° = \csc(2a)°$, find the smallest positive value of a, in degrees.

171 Given angle A in Quadrant I with $\sin A = \dfrac{12}{13}$ and angle B in Quadrant II with $\cos B = -\dfrac{3}{5}$, what is the value of $\cos(A - B)$?
1) $\dfrac{33}{65}$
2) $-\dfrac{33}{65}$
3) $\dfrac{63}{65}$
4) $-\dfrac{63}{65}$

172 The expression $x^2(x + 2) - (x + 2)$ is equivalent to
1) x^2
2) $x^2 - 1$
3) $x^3 + 2x^2 - x + 2$
4) $(x + 1)(x - 1)(x + 2)$

173 Which expression is equivalent to $\left(9x^2 y^6\right)^{-\frac{1}{2}}$?
1) $\dfrac{1}{3xy^3}$
2) $3xy^3$
3) $\dfrac{3}{xy^3}$
4) $\dfrac{xy^3}{3}$

174 A math club has 30 boys and 20 girls. Which expression represents the total number of different 5-member teams, consisting of 3 boys and 2 girls, that can be formed?
1) $_{30}P_3 \cdot {}_{20}P_2$
2) $_{30}C_3 \cdot {}_{20}C_2$
3) $_{30}P_3 + {}_{20}P_2$
4) $_{30}C_3 + {}_{20}C_2$

175 The expression $\dfrac{\cot x}{\csc x}$ is equivalent to
1) $\sin x$
2) $\cos x$
3) $\tan x$
4) $\sec x$

176 If $x = 3i$, $y = 2i$, and $z = m + i$, the expression $xy^2 z$ equals
1) $-12 - 12mi$
2) $-6 - 6mi$
3) $12 - 12mi$
4) $6 - 6mi$

177 Susie invests $500 in an account that is compounded continuously at an annual interest rate of 5%, according to the formula $A = Pe^{rt}$, where A is the amount accrued, P is the principal, r is the rate of interest, and t is the time, in years. Approximately how many years will it take for Susie's money to double?
1) 1.4
2) 6.0
3) 13.9
4) 14.7

178 Express in simplest form: $\sqrt[3]{\dfrac{a^6 b^9}{-64}}$

179 The number of possible different 12-letter arrangements of the letters in the word "TRIGONOMETRY" is represented by
1) $\dfrac{12!}{3!}$
2) $\dfrac{12!}{6!}$
3) $\dfrac{{}_{12}P_{12}}{8}$
4) $\dfrac{{}_{12}P_{12}}{6!}$

180 If $\tan\left(\text{Arc}\cos\dfrac{\sqrt{3}}{k}\right) = \dfrac{\sqrt{3}}{3}$, then k is
1) 1
2) 2
3) $\sqrt{2}$
4) $3\sqrt{2}$

181 Find the third term in the recursive sequence $a_{k+1} = 2a_k - 1$, where $a_1 = 3$.

182 Which equation is graphed in the diagram below?
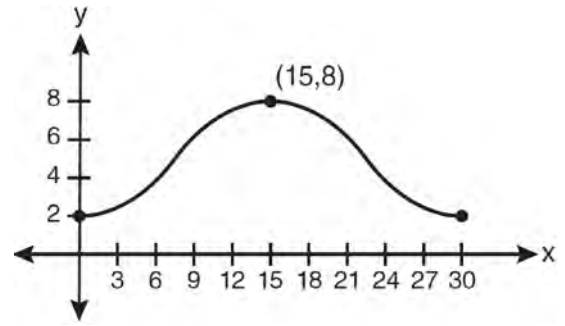
1) $y = 3\cos\left(\dfrac{\pi}{30} x\right) + 8$
2) $y = 3\cos\left(\dfrac{\pi}{15} x\right) + 5$
3) $y = -3\cos\left(\dfrac{\pi}{30} x\right) + 8$
4) $y = -3\cos\left(\dfrac{\pi}{15} x\right) + 5$

183 What is the equation of the circle passing through the point $(6,5)$ and centered at $(3,-4)$?
1) $(x-6)^2 + (y-5)^2 = 82$
2) $(x-6)^2 + (y-5)^2 = 90$
3) $(x-3)^2 + (y+4)^2 = 82$
4) $(x-3)^2 + (y+4)^2 = 90$

184 Express $\cos\theta(\sec\theta - \cos\theta)$, in terms of $\sin\theta$.

185 A jogger ran $\frac{1}{3}$ mile on day 1, and $\frac{2}{3}$ mile on day 2, and $1\frac{1}{3}$ miles on day 3, and $2\frac{2}{3}$ miles on day 4, and this pattern continued for 3 more days. Which expression represents the total distance the jogger ran?

1) $\sum_{d=1}^{7} \frac{1}{3}(2)^{d-1}$

2) $\sum_{d=1}^{7} \frac{1}{3}(2)^{d}$

3) $\sum_{d=1}^{7} 2\left(\frac{1}{3}\right)^{d-1}$

4) $\sum_{d=1}^{7} 2\left(\frac{1}{3}\right)^{d}$

186 A blood bank needs twenty people to help with a blood drive. Twenty-five people have volunteered. Find how many different groups of twenty can be formed from the twenty-five volunteers.

187 In parallelogram $BFLO$, $\overline{OL} = 3.8$, $LF = 7.4$, and m$\angle O = 126$. If diagonal $\overline{BL}$ is drawn, what is the area of $\triangle BLF$?
1) 11.4
2) 14.1
3) 22.7
4) 28.1

188 Two sides of a parallelogram measure 27 cm and 32 cm. The included angle measures 48°. Find the length of the longer diagonal of the parallelogram, to the *nearest centimeter*.

189 Because Sam's backyard gets very little sunlight, the probability that a geranium planted there will flower is 0.28. Sam planted five geraniums. Determine the probability, to the *nearest thousandth*, that *at least* four geraniums will flower.

190 Determine the solution of the inequality $|3 - 2x| \geq 7$. [The use of the grid below is optional.]
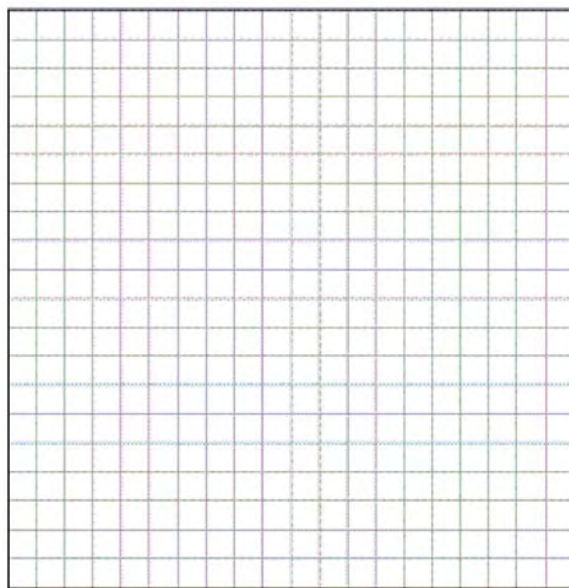
191 The yearbook staff has designed a survey to learn student opinions on how the yearbook could be improved for this year. If they want to distribute this survey to 100 students and obtain the most reliable data, they should survey
1) every third student sent to the office
2) every third student to enter the library
3) every third student to enter the gym for the basketball game
4) every third student arriving at school in the morning

192 Determine the sum of the first twenty terms of the sequence whose first five terms are 5, 14, 23, 32, 41.

193 Which expression always equals 1?
1) $\cos^2 x - \sin^2 x$
2) $\cos^2 x + \sin^2 x$
3) $\cos x - \sin x$
4) $\cos x + \sin x$

194 The expression $(x + i)^2 - (x - i)^2$ is equivalent to
1) 0
2) -2
3) $-2 + 4xi$
4) $4xi$

195 Which expression represents the total number of different 11-letter arrangements that can be made using the letters in the word "MATHEMATICS"?
1) $\dfrac{11!}{3!}$
2) $\dfrac{11!}{2! + 2! + 2!}$
3) $\dfrac{11!}{8!}$
4) $\dfrac{11!}{2! \cdot 2! \cdot 2!}$

196 An angle, P, drawn in standard position, terminates in Quadrant II if
1) $\cos P < 0$ and $\csc P < 0$
2) $\sin P > 0$ and $\cos P > 0$
3) $\csc P > 0$ and $\cot P < 0$
4) $\tan P < 0$ and $\sec P > 0$

197 Which expression is equivalent to $\left(3x^2 \right)^{-1}$?
1) $\dfrac{1}{3x^2}$
2) $-3x^2$
3) $\dfrac{1}{9x^2}$
4) $-9x^2$

198 Write an equation of the circle shown in the diagram below.
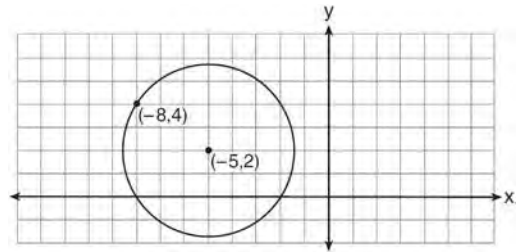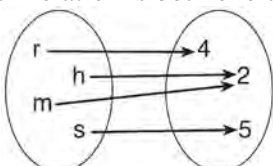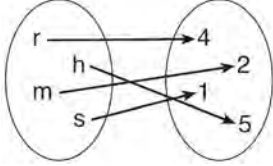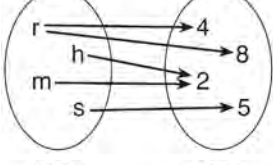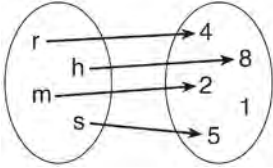
199 What is the range of the function shown below?
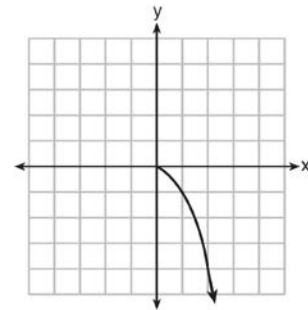
1) $x \le 0$
2) $x \ge 0$
3) $y \le 0$
4) $y \ge 0$

200 Which relation is both one-to-one and onto?
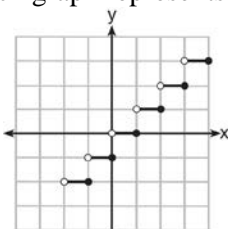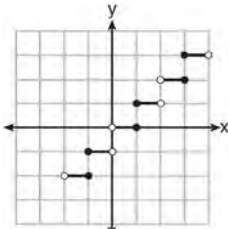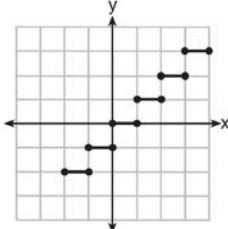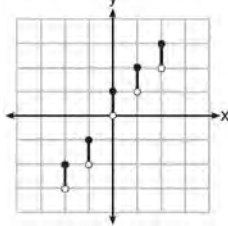
1)

2)

3)

4)

201 Determine algebraically the x-coordinate of all points where the graphs of $xy = 10$ and $y = x + 3$ intersect.

202 The discriminant of a quadratic equation is 24. The roots are
1) imaginary
2) real, rational, and equal
3) real, rational, and unequal
4) real, irrational, and unequal

203 Which graph represents a function?

1)

2)

3)

4)

204 In a certain high school, a survey revealed the mean amount of bottled water consumed by students each day was 153 bottles with a standard deviation of 22 bottles. Assuming the survey represented a normal distribution, what is the range of the number of bottled waters that approximately 68.2% of the students drink?
1) $131 - 164$
2) $131 - 175$
3) $142 - 164$
4) $142 - 175$

205 What is the product of the roots of the quadratic equation $2x^2 - 7x = 5$?
1) 5
2) $\frac{5}{2}$
3) −5
4) $-\frac{5}{2}$

206 The expression $\sin(\theta + 90)°$ is equivalent to
1) $-\sin\theta$
2) $-\cos\theta$
3) $\sin\theta$
4) $\cos\theta$

207 Solve algebraically for all exact values of x in the interval $0 \le x < 2\pi$: $2\sin^2 x + 5\sin x = 3$

208 Circle O shown below has a radius of 12 centimeters. To the *nearest tenth of a centimeter*, determine the length of the arc, x, subtended by an angle of 83°50'.
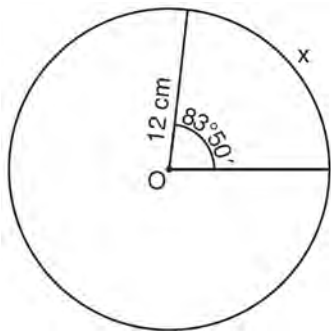
209 Express the exact value of csc 60°, with a rational denominator.

210 The simplest form of $\dfrac{1 - \dfrac{4}{x}}{1 - \dfrac{2}{x} - \dfrac{8}{x^2}}$ is
1) $\frac{1}{2}$
2) $\frac{x}{x+2}$
3) $\frac{x}{3}$
4) $-\frac{x}{x-2}$

211 What is the common ratio of the geometric sequence shown below?
$$-2, 4, -8, 16, \ldots$$
1) $-\frac{1}{2}$
2) 2
3) −2
4) −6

212 In $\triangle MNP$, $m = 6$ and $n = 10$. Two distinct triangles can be constructed if the measure of angle M is
1) 35
2) 40
3) 45
4) 50

213 Solve $\sec x - \sqrt{2} = 0$ algebraically for all values of x in $0° \le x < 360°$.

214 The expression $\sqrt[3]{64a^{16}}$ is equivalent to
1) $8a^4$
2) $8a^8$
3) $4a^5 \sqrt[3]{a}$
4) $4a \sqrt[3]{a^5}$

215 Express in simplest terms: $\dfrac{1 + \dfrac{3}{x}}{1 - \dfrac{5}{x} - \dfrac{24}{x^2}}$

216 The expression $\dfrac{x^2 + 9x - 22}{x^2 - 121} \div (2 - x)$ is equivalent to
1) $x - 11$
2) $\dfrac{1}{x - 11}$
3) $11 - x$
4) $\dfrac{1}{11 - x}$

217 The expression $\left(2 - 3\sqrt{x}\right)^2$ is equivalent to
1) $4 - 9x$
2) $4 - 3x$
3) $4 - 12\sqrt{x} + 9x$
4) $4 - 12\sqrt{x} + 6x$

218 On a multiple-choice test, Abby randomly guesses on all seven questions. Each question has four choices. Find the probability, to the *nearest thousandth*, that Abby gets *exactly* three questions correct.

219 The points $(2,3)$, $\left(4, \dfrac{3}{4}\right)$, and $(6, d)$ lie on the graph of a function. If y is inversely proportional to the square of x, what is the value of d?
1) 1
2) $\dfrac{1}{3}$
3) 3
4) 27

220 Solve algebraically for all values of x:
$\log_{(x+3)}(2x + 3) + \log_{(x+3)}(x + 5) = 2$

221 Expressed with a rational denominator and in simplest form, $\dfrac{x}{x - \sqrt{x}}$ is
1) $\dfrac{x^2 + x\sqrt{x}}{x^2 - x}$
2) $-\sqrt{x}$
3) $\dfrac{x + \sqrt{x}}{1 - x}$
4) $\dfrac{x + \sqrt{x}}{x - 1}$

30

222 What is the fourth term in the binomial expansion $(x-2)^8$?
1) $448x^5$
2) $448x^4$
3) $-448x^5$
4) $-448x^4$

223 When factored completely, $x^3 + 3x^2 - 4x - 12$ equals
1) $(x+2)(x-2)(x-3)$
2) $(x+2)(x-2)(x+3)$
3) $(x^2-4)(x+3)$
4) $(x^2-4)(x-3)$

224 Determine the sum and the product of the roots of $3x^2 = 11x - 6$.

225 What is the conjugate of $\frac{1}{2} + \frac{3}{2}i$?

1) $-\frac{1}{2} + \frac{3}{2}i$

2) $\frac{1}{2} - \frac{3}{2}i$

3) $\frac{3}{2} + \frac{1}{2}i$

4) $-\frac{1}{2} - \frac{3}{2}i$

226 If the amount of time students work in any given week is normally distributed with a mean of 10 hours per week and a standard deviation of 2 hours, what is the probability a student works between 8 and 11 hours per week?
1) 34.1%
2) 38.2%
3) 53.2%
4) 68.2%

227 What is a positive value of $\tan \frac{1}{2}x$, when $\sin x = 0.8$?
1) 0.5
2) 0.4
3) 0.33
4) 0.25

228 The heights, in inches, of 10 high school varsity basketball players are 78, 79, 79, 72, 75, 71, 74, 74, 83, and 71. Find the interquartile range of this data set.

229 Which equation represents a graph that has a period of 4π?

1) $y = 3\sin \frac{1}{2}x$

2) $y = 3\sin 2x$

3) $y = 3\sin \frac{1}{4}x$

4) $y = 3\sin 4x$

230 Which function is one-to-one?
1) $f(x) = |x|$
2) $f(x) = 2^x$
3) $f(x) = x^2$
4) $f(x) = \sin x$

231 Which survey is *least* likely to contain bias?
1) surveying a sample of people leaving a movie theater to determine which flavor of ice cream is the most popular
2) surveying the members of a football team to determine the most watched TV sport
3) surveying a sample of people leaving a library to determine the average number of books a person reads in a year
4) surveying a sample of people leaving a gym to determine the average number of hours a person exercises per week

232 What is the common difference in the sequence $2a + 1, 4a + 4, 6a + 7, 8a + 10, \ldots$?
1) $2a + 3$
2) $-2a - 3$
3) $2a + 5$
4) $-2a + 5$

233 A market research firm needs to collect data on viewer preferences for local news programming in Buffalo. Which method of data collection is most appropriate?
1) census
2) survey
3) observation
4) controlled experiment

234 A school math team consists of three juniors and five seniors. How many different groups can be formed that consist of one junior and two seniors?
1) 13
2) 15
3) 30
4) 60

235 Which statement is true about the graphs of f and g shown below?
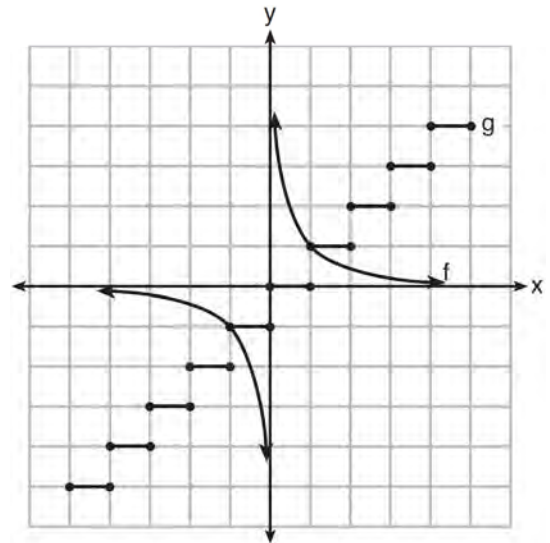
1) f is a relation and g is a function.
2) f is a function and g is a relation.
3) Both f and g are functions.
4) Neither f nor g is a function.

236 How many different ways can teams of four members be formed from a class of 20 students?
1) 5
2) 80
3) 4,845
4) 116,280

Algebra 2/Trigonometry Regents at Random
Answer Section

1 ANS: 4
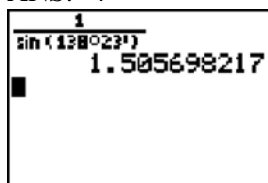
  PTS: 2   REF: 061217a2   STA: A2.A.66   TOP: Determining Trigonometric Functions
2 ANS: 2

$$\sqrt{2x-4} = x-2$$

$$2x-4 = x^2 - 4x + 4$$

$$0 = x^2 - 6x + 8$$

$$0 = (x-4)(x-2)$$

$$x = 4, 2$$

  PTS: 2   REF: 061406a2   STA: A2.A.22   TOP: Solving Radicals
  KEY: extraneous solutions
3 ANS: 1   PTS: 2   REF: 061324a2   STA: A2.A.9
  TOP: Negative Exponents
4 ANS:

$-4x + 5 < 13 \quad -4x + 5 > -13 \quad -2 < x < 4.5$

$\quad -4x < 8 \qquad -4x > -18$

$\quad\quad x > -2 \qquad x < 4.5$

  PTS: 2   REF: 011432a2   STA: A2.A.1   TOP: Absolute Value Inequalities
5 ANS: 4   PTS: 2   REF: 061206a2   STA: A2.A.60
  TOP: Unit Circle

6 ANS: 2

$$320 = 10(2)^{\frac{t}{60}}$$

$$32 = (2)^{\frac{t}{60}}$$

$$\log 32 = \log(2)^{\frac{t}{60}}$$

$$\log 32 = \frac{t \log 2}{60}$$

$$\frac{60 \log 32}{\log 2} = t$$

$$300 = t$$

PTS: 2   REF: 011205a2   STA: A2.A.6   TOP: Exponential Growth

7 ANS: 4

$\log 2x^3 = \log 2 + \log x^3 = \log 2 + 3 \log x$

PTS: 2   REF: 061426a2   STA: A2.A.19   TOP: Properties of Logarithms
KEY: splitting logs

8 ANS: 4

$\dfrac{13}{\sin 40} = \dfrac{20}{\sin M}$. $81 + 40 < 180$. $(180 - 81) + 40 < 180$

$M \approx 81$

PTS: 2   REF: 061327a2   STA: A2.A.75   TOP: Law of Sines - The Ambiguous Case

9 ANS: 3

As originally written, alternatives (2) and (3) had no domain restriction, so that both were correct.

PTS: 2   REF: 061405a2   STA: A2.A.52
TOP: Properties of Graphs of Functions and Relations

10 ANS: 3

$$\frac{3y}{2y - 6} + \frac{9}{6 - 2y} = \frac{3y}{2y - 6} - \frac{9}{2y - 6} = \frac{3y - 9}{2y - 6} = \frac{3(y - 3)}{2(y - 3)} = \frac{3}{2}$$

PTS: 2   REF: 011325a2   STA: A2.A.16   TOP: Addition and Subtraction of Rationals

11 ANS: 2

Since the coefficient of t is greater than 0, $r > 0$.

PTS: 2   REF: 011303a2   STA: A2.S.8   TOP: Correlation Coefficient

12 ANS: 2

$$\frac{-\frac{3}{32}a^3b^4}{\frac{1}{64}a^5b^3} = -\frac{6b}{a^2}$$

PTS: 2   REF: 061326a2   STA: A2.A.31   TOP: Sequences

13 ANS:

$$\frac{-2(x^2+6)}{x^4} \cdot \frac{x^2(x-3)+6(x-3)}{x^2-4x} \cdot \frac{2x-4}{x^4-3x^3} \div \frac{x^2+2x-8}{16-x^2}$$

$$\frac{(x^2+6)(x-3)}{x(x-4)} \cdot \frac{2(x-2)}{x^3(x-3)} \cdot \frac{(4+x)(4-x)}{(x+4)(x-2)}$$

$$\frac{-2(x^2+6)}{x^4}$$

PTS: 6   REF: 011239a2   STA: A2.A.16   TOP: Multiplication and Division of Rationals
KEY: division

14 ANS: 3
$(-5)^2 - 4(2)(0) = 25$

PTS: 2   REF: 061423a2   STA: A2.A.2   TOP: Using the Discriminant
KEY: determine equation given nature of roots

15 ANS:

$$\frac{100}{\sin 32} = \frac{b}{\sin 105}. \quad \frac{100}{\sin 32} = \frac{a}{\sin 43}$$

$$b \approx 182.3 \qquad a \approx 128.7$$

PTS: 4   REF: 011338a2   STA: A2.A.73   TOP: Law of Sines
KEY: basic

16 ANS:

$$\frac{\cot x \sin x}{\sec x} = \frac{\frac{\cos x}{\sin x}\sin x}{\frac{1}{\cos x}} = \cos^2 x$$

PTS: 2   REF: 061334a2   STA: A2.A.58   TOP: Reciprocal Trigonometric Relationships

17 ANS: 3

$$x + y = 5 \qquad . \quad -5 + y = 5$$
$$y = -x + 5 \qquad y = 10$$

$$(x + 3)^2 + (-x + 5 - 3)^2 = 53$$

$$x^2 + 6x + 9 + x^2 - 4x + 4 = 53$$

$$2x^2 + 2x - 40 = 0$$

$$x^2 + x - 20 = 0$$

$$(x + 5)(x - 4) = 0$$

$$x = -5, 4$$

PTS: 2   REF: 011302a2   STA: A2.A.3   TOP: Quadratic-Linear Systems
KEY: equations

18 ANS: 2
Top 6.7% = 1.5 s.d. $+ \sigma = 1.5(104) + 576 = 732$

PTS: 2   REF: 011420a2   STA: A2.S.5   TOP: Normal Distributions
KEY: predict

19 ANS:

88. $\dfrac{100}{\sin 33} = \dfrac{x}{\sin 32}$. $\sin 66 \approx \dfrac{T}{97.3}$

$\quad x \approx 97.3 \qquad\quad t \approx 88$

PTS: 4   REF: 011236a2   STA: A2.A.73   TOP: Law of Sines
KEY: advanced

20 ANS:
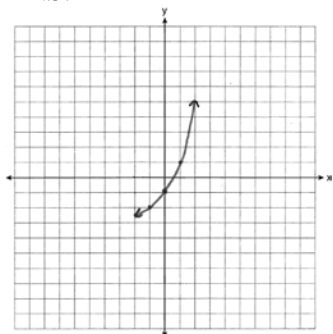
PTS: 2   REF: 011234a2   STA: A2.A.53   TOP: Graphing Exponential Functions

21 ANS: 4
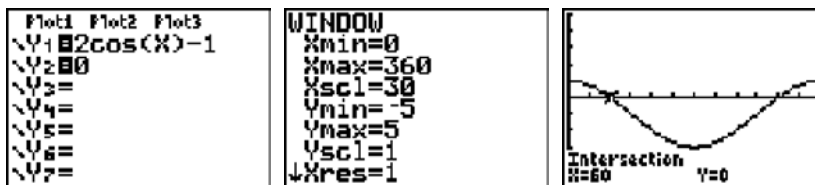
$2\cos\theta = 1$

$\cos\theta = \dfrac{1}{2}$

$\theta = \cos^{-1}\dfrac{1}{2} = 60, 300$

PTS: 2   REF: 061203a2   STA: A2.A.68   TOP: Trigonometric Equations
KEY: basic

22 ANS: 2   PTS: 2   REF: 061216a2   STA: A2.A.42
TOP: Compositions of Functions   KEY: variables

23 ANS: 2

$(x+2)^2 = -9$

$x + 2 = \pm\sqrt{-9}$

$x = -2 \pm 3i$

PTS: 2   REF: 011408a2   STA: A2.A.24   TOP: Completing the Square

24 ANS:

$Q_1 = 3.5$ and $Q_3 = 10.5$. $10.5 - 3.5 = 7$.

PTS: 2   REF: 011430a2   STA: A2.S.4   TOP: Dispersion
KEY: range, quartiles, interquartile range, variance

25 ANS: 4

$8^{3k+4} = 4^{2k-1}$.

$(2^3)^{3k+4} = (2^2)^{2k-1}$

$2^{9k+12} = 2^{4k-2}$

$9k + 12 = 4k - 2$

$5k = -14$

$k = -\dfrac{14}{5}$

PTS: 2   REF: 011309a2   STA: A2.A.27   TOP: Exponential Equations
KEY: common base not shown

26 ANS: 1

$$10 \cdot \frac{3}{2} = \frac{3}{5} p$$

$$15 = \frac{3}{5} p$$

$$25 = p$$

PTS: 2 REF: 011226a2 STA: A2.A.5 TOP: Inverse Variation

27 ANS: 1 PTS: 2 REF: 061210a2 STA: A2.A.9
TOP: Negative Exponents

28 ANS: 1 PTS: 2 REF: 061202a2 STA: A2.A.51
TOP: Domain and Range

29 ANS: 3

$$\sqrt{9}\sqrt{-1}\sqrt{2} - \sqrt{16}\sqrt{-1}\sqrt{2} = 3i\sqrt{2} - 4i\sqrt{2} = -i\sqrt{2}$$

PTS: 2 REF: 061404a2 STA: A2.N.6 TOP: Square Roots of Negative Numbers

30 ANS: 2

If $\sin A = -\frac{7}{25}$, $\cos A = \frac{24}{25}$, and $\tan A = \frac{\sin A}{\cos A} = \frac{-\frac{7}{25}}{\frac{24}{25}} = -\frac{7}{24}$

PTS: 2 REF: 011413a2 STA: A2.A.64 TOP: Using Inverse Trigonometric Functions
KEY: advanced

31 ANS: 1

$2x - 1 > 5. \quad 2x - 1 < -5$

$\quad 2x > 6 \qquad 2x > -4$

$\quad x > 3 \qquad x < -2$

PTS: 2 REF: 061307a2 STA: A2.A.1 TOP: Absolute Value Inequalities
KEY: graph

32 ANS: 2 PTS: 2 REF: 011315a2 STA: A2.A.55
TOP: Trigonometric Ratios

33 ANS: 1 PTS: 2 REF: 061211a2 STA: A2.A.54
TOP: Graphing Logarithmic Functions

34 ANS:

$x < -1$ or $x > 5$. $\quad x^2 - 4x - 5 > 0$. $\quad x - 5 > 0$ and $x + 1 > 0$ or $x - 5 < 0$ and $x + 1 < 0$

$\qquad\qquad (x - 5)(x + 1) > 0 \qquad x > 5$ and $x > -1 \qquad x < 5$ and $x < -1$

$\qquad\qquad\qquad\qquad\qquad\qquad x > 5 \qquad\qquad\qquad x < -1$

PTS: 2 REF: 011228a2 STA: A2.A.4 TOP: Quadratic Inequalities
KEY: one variable

35 ANS:

$$g(10) = \left(a(10)\sqrt{1-10} \right)^2 = 100a^2(-9) = -900a^2$$

PTS: 2   REF: 061333a2   STA: A2.A.41   TOP: Functional Notation

36 ANS: 2

$$\log x^2 = \log 3a + \log 2a$$

$$2\log x = \log 6a^2$$

$$\log x = \frac{\log 6}{2} + \frac{\log a^2}{2}$$

$$\log x = \frac{1}{2}\log 6 + \frac{2\log a}{2}$$

$$\log x = \frac{1}{2}\log 6 + \log a$$

PTS: 2   REF: 011224a2   STA: A2.A.19   TOP: Properties of Logarithms
KEY: splitting logs

37 ANS:

800. $x = 4^{2.5} = 32.$ $y^{-\frac{3}{2}} = 125$. $\dfrac{x}{y} = \dfrac{32}{\frac{1}{25}} = 800$

$$y = 125^{-\frac{2}{3}} = \frac{1}{25}$$

PTS: 4   REF: 011237a2   STA: A2.A.28   TOP: Logarithmic Equations
KEY: advanced

38 ANS:

$$\frac{2 \pm \sqrt{(-2)^2 - 4(6)(-3)}}{2(6)} = \frac{2 \pm \sqrt{76}}{12} = \frac{2 \pm \sqrt{4}\sqrt{19}}{12} = \frac{2 \pm 2\sqrt{19}}{12} = \frac{1 \pm \sqrt{19}}{6}$$

PTS: 2   REF: 011332a2   STA: A2.A.25   TOP: Quadratics with Irrational Solutions

39 ANS: 2

$$\frac{x^{-1}+1}{x+1} = \frac{\frac{1}{x}+1}{x+1} = \frac{\frac{1+x}{x}}{x+1} = \frac{1}{x}$$

PTS: 2   REF: 011211a2   STA: A2.A.9   TOP: Negative Exponents

40 ANS: 4

$$_3C_2 \left(\frac{5}{8}\right)^2 \left(\frac{3}{8}\right)^1 = \frac{225}{512}$$

PTS: 2   REF: 011221a2   STA: A2.S.15   TOP: Binomial Probability
KEY: spinner

41 ANS: 4

$$g\left(\frac{1}{2}\right) = \frac{1}{\frac{1}{2}} = 2. \ f(2) = 4(2) - 2^2 = 4$$

PTS: 2   REF: 011204a2   STA: A2.A.42   TOP: Compositions of Functions
KEY: numbers

42 ANS:

$$(x+4)^2 = 17x - 4$$

$$x^2 + 8x + 16 = 17x - 4$$

$$x^2 - 9x + 20 = 0$$

$$(x-4)(x-5) = 0$$

$$x = 4,5$$

PTS: 4   REF: 011336a2   STA: A2.A.28   TOP: Logarithmic Equations
KEY: basic

43 ANS: 1
$$\sin(180 + x) = (\sin 180)(\cos x) + (\cos 180)(\sin x) = 0 + (-\sin x) = -\sin x$$

PTS: 2   REF: 011318a2   STA: A2.A.76   TOP: Angle Sum and Difference Identities
KEY: identities

44 ANS: 2
$$\text{sum: } \frac{-b}{a} = \frac{4}{6} = \frac{2}{3}. \ \text{ product: } \frac{c}{a} = \frac{-12}{6} = -2$$

PTS: 2   REF: 011209a2   STA: A2.A.20   TOP: Roots of Quadratics

45 ANS: 1   PTS: 2   REF: 011313a2   STA: A2.A.39
TOP: Domain and Range   KEY: real domain

46 ANS: 3
$$h(-8) = \frac{1}{2}(-8) - 2 = -4 - 2 = -6. \ g(-6) = \frac{1}{2}(-6) + 8 = -3 + 8 = 5$$

PTS: 2   REF: 011403a2   STA: A2.A.42   TOP: Compositions of Functions
KEY: numbers

47 ANS: 3

$$3x^5 - 48x = 0$$

$$3x(x^4 - 16) = 0$$

$$3x(x^2 + 4)(x^2 - 4) = 0$$

$$3x(x^2 + 4)(x + 2)(x - 2) = 0$$

PTS: 2   REF: 011216a2   STA: A2.A.26   TOP: Solving Polynomial Equations

48 ANS:

−104.

PTS: 2 REF: 011230a2 STA: A2.N.10 TOP: Sigma Notation
KEY: basic

49 ANS:

$3 \times \dfrac{180}{\pi} \approx 171.89° \approx 171°53'$.

PTS: 2 REF: 011335a2 STA: A2.M.2 TOP: Radian Measure
KEY: degrees

50 ANS: 3 PTS: 2 REF: 061219a2 STA: A2.N.8
TOP: Conjugates of Complex Numbers

51 ANS:

$_5C_0 \cdot 0.57^0 \cdot 0.43^5 + {}_5C_1 \cdot 0.57^1 \cdot 0.43^4 + {}_5C_2 \cdot 0.57^2 \cdot 0.43^3 \approx 0.37$

PTS: 4 REF: 061438a2 STA: A2.S.15 TOP: Binomial Probability
KEY: at least or at most

52 ANS:

$y = 0.488(1.116)^x$

PTS: 2 REF: 061429a2 STA: A2.S.7 TOP: Exponential Regression

53 ANS: 3
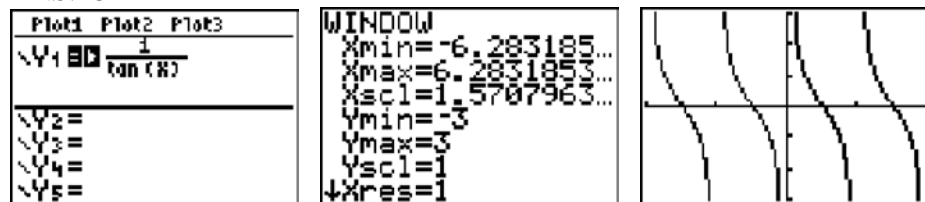
PTS: 2 REF: 011207a2 STA: A2.A.71 TOP: Graphing Trigonometric Functions

54 ANS: 4 PTS: 2 REF: 011219a2 STA: A2.A.52
TOP: Properties of Graphs of Functions and Relations

55 ANS: 1
The binomials are conjugates, so use FL.

PTS: 2 REF: 061201a2 STA: A2.N.3 TOP: Operations with Polynomials

56 ANS: 4

$$\left(\sqrt[3]{27x^2}\right)\left(\sqrt[3]{16x^4}\right) = \sqrt[3]{3^3 \cdot 2^4 \cdot x^6} = 3 \cdot 2 \cdot x^2 \sqrt[3]{2} = 6x^2 \sqrt[3]{2}$$

PTS: 2   REF: 011421a2   STA: A2.N.2   TOP: Operations with Radicals

57 ANS: 4

$$\cos 2A = 1 - 2\sin^2 A = 1 - 2\left(\frac{1}{3}\right)^2 = 1 - \frac{2}{9} = \frac{7}{9}$$

PTS: 2   REF: 011311a2   STA: A2.A.77   TOP: Double Angle Identities
KEY: evaluating

58 ANS: 1

$$f(g(x)) = 2(x+5)^2 - 3(x+5) + 1 = 2(x^2 + 10x + 25) - 3x - 15 + 1 = 2x^2 + 17x + 36$$

PTS: 2   REF: 061419a2   STA: A2.A.42   TOP: Compositions of Functions
KEY: variables

59 ANS:

$$y = 215.983(1.652)^x. \quad 215.983(1.652)^7 \approx 7250$$

PTS: 4   REF: 011337a2   STA: A2.S.7   TOP: Exponential Regression

60 ANS: 3

$$s = \theta r = \frac{2\pi}{8} \cdot 6 = \frac{3\pi}{2}$$

PTS: 2   REF: 061212a2   STA: A2.A.61   TOP: Arc Length
KEY: arc length

61 ANS: 3   PTS: 2   REF: 011305a2   STA: A2.A.37
TOP: Defining Functions
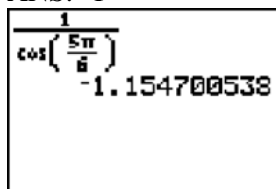
62 ANS: 4   PTS: 2   REF: 061303a2   STA: A2.A.43
TOP: Defining Functions

63 ANS: 1

```
          1
     ┌─────────┐
     │ cos( 5π )│
     │      6   │
     │    -1.154700538
```

PTS: 2   REF: 011203a2   STA: A2.A.66   TOP: Determining Trigonometric Functions

64 ANS:

7. $4 - \sqrt{2x - 5} = 1$

$-\sqrt{2x - 5} = -3$

$2x - 5 = 9$

$2x = 14$

$x = 7$

PTS: 2   REF: 011229a2   STA: A2.A.22   TOP: Solving Radicals
KEY: basic

65 ANS: 1

$\dfrac{1}{7 - \sqrt{11}} \cdot \dfrac{7 + \sqrt{11}}{7 + \sqrt{11}} = \dfrac{7 + \sqrt{11}}{49 - 11} = \dfrac{7 + \sqrt{11}}{38}$

PTS: 2   REF: 011404a2   STA: A2.N.5   TOP: Rationalizing Denominators

66 ANS: 1

$2 \cdot \dfrac{180}{\pi} = \dfrac{360}{\pi}$

PTS: 2   REF: 011220a2   STA: A2.M.2   TOP: Radian Measure
KEY: degrees

67 ANS:

$\sigma_x \approx 6.2.$ 6 scores are within a population standard deviation of the mean. $Q_3 - Q_1 = 41 - 37 = 4$

$\overline{x} \approx 38.2$

PTS: 4   REF: 061338a2   STA: A2.S.4   TOP: Dispersion
KEY: advanced

68 ANS: 1

$5 \cdot \dfrac{180}{\pi} \approx 286$

PTS: 2   REF: 011427a2   STA: A2.M.2   TOP: Radian Measure
KEY: degrees

69 ANS:

$$81^{x^3 + 2x^2} = 27^{\frac{5x}{3}}$$

$$\left(3^4\right)^{x^3 + 2x^2} = \left(3^3\right)^{\frac{5x}{3}}$$

$$3^{4x^3 + 8x^2} = 3^{5x}$$

$$4x^3 + 8x^2 - 5x = 0$$

$$x(4x^2 + 8x - 5) = 0$$

$$x(2x - 1)(2x + 5) = 0$$

$$x = 0, \frac{1}{2}, -\frac{5}{2}$$

PTS: 6   REF: 061239a2   STA: A2.A.27   TOP: Exponential Equations
KEY: common base not shown

70 ANS: 2   PTS: 2   REF: 011222a2   STA: A2.A.39
TOP: Domain and Range   KEY: real domain

71 ANS: 1

$\dfrac{9}{\sin A} = \dfrac{10}{\sin 70}$. $58° + 70°$ is possible. $122° + 70°$ is not possible.

$$A \approx 58$$

PTS: 2   REF: 011210a2   STA: A2.A.75   TOP: Law of Sines - The Ambiguous Case

72 ANS: 3   PTS: 2   REF: 061412a2   STA: A2.A.60
TOP: Finding the Terminal Side of an Angle

73 ANS:

$$(x + yi)(x - yi) = x^2 - y^2 i^2 = x^2 + y^2$$

PTS: 2   REF: 061432a2   STA: A2.N.9
TOP: Multiplication and Division of Complex Numbers

74 ANS: 2   PTS: 2   REF: 011301a2   STA: A2.A.52
TOP: Identifying the Equation of a Graph

75 ANS: 2
The binomials are conjugates, so use FL.

PTS: 2   REF: 011206a2   STA: A2.N.3   TOP: Operations with Polynomials

76 ANS:

$$30700 = 50e^{3t}$$

$$614 = e^{3t}$$

$$\ln 614 = \ln e^{3t}$$

$$\ln 614 = 3t \ln e$$

$$\ln 614 = 3t$$

$$2.14 \approx t$$

PTS: 2   REF: 011333a2   STA: A2.A.6   TOP: Exponential Growth

77 ANS: 3

$$20 \cdot 2 = -5t$$

$$-8 = t$$

PTS: 2   REF: 011412a2   STA: A2.A.5   TOP: Inverse Variation

78 ANS: 1

$$5x + 29 = (x + 3)^2 \qquad . \quad (-5) + 3 \text{ shows an extraneous solution.}$$

$$5x + 29 = x^2 + 6x + 9$$

$$0 = x^2 + x - 20$$

$$0 = (x + 5)(x - 4)$$

$$x = -5, 4$$

PTS: 2   REF: 061213a2   STA: A2.A.22   TOP: Solving Radicals
KEY: extraneous solutions

79 ANS: 3

$$_3C_2 (2x^4)^1 (-y)^2 = 6x^4 y^2$$

PTS: 2   REF: 011215a2   STA: A2.A.36   TOP: Binomial Expansions

80 ANS:

$$\frac{13}{x} = 10 - x \qquad . \quad x = \frac{10 \pm \sqrt{100 - 4(1)(13)}}{2(1)} = \frac{10 \pm \sqrt{48}}{2} = \frac{10 \pm 4\sqrt{3}}{2} = 5 \pm 2\sqrt{3}$$

$$13 = 10x - x^2$$

$$x^2 - 10x + 13 = 0$$

PTS: 4   REF: 061336a2   STA: A2.A.23   TOP: Solving Rationals
KEY: irrational and complex solutions

81 ANS: 2   PTS: 2   REF: 061322a2   STA: A2.A.73
TOP: Law of Sines   KEY: modeling

82 ANS:

$$x^4 + 4x^3 + 4x^2 + 16x = 0$$

$$x(x^3 + 4x^2 + 4x + 16) = 0$$

$$x(x^2(x+4) + 4(x+4)) = 0$$

$$x(x^2 + 4)(x + 4) = 0$$

$$x = 0, \pm 2i, -4$$

PTS: 6   REF: 061339a2   STA: A2.A.26   TOP: Solving Polynomial Equations

83 ANS: 2

$$60 = -16t^2 + 5t + 105 \quad t = \frac{-5 \pm \sqrt{5^2 - 4(-16)(45)}}{2(-16)} \approx \frac{-5 \pm 53.89}{-32} \approx 1.84$$

$$0 = -16t^2 + 5t + 45$$

PTS: 2   REF: 061424a2   STA: A2.A.25   TOP: Quadratics with Irrational Solutions

84 ANS: 2

$$\log 9 - \log 20$$

$$\log 3^2 - \log(10 \cdot 2)$$

$$2\log 3 - (\log 10 + \log 2)$$

$$2b - (1 + a)$$

$$2b - a - 1$$

PTS: 2   REF: 011326a2   STA: A2.A.19   TOP: Properties of Logarithms
KEY: expressing logs algebraically

85 ANS: 1   PTS: 2   REF: 011320a2   STA: A2.A.72
TOP: Identifying the Equation of a Trigonometric Graph

86 ANS: 2

$$\frac{8\pi}{5} \cdot \frac{180}{\pi} = 288$$

PTS: 2   REF: 061302a2   STA: A2.M.2   TOP: Radian Measure
KEY: degrees

87 ANS: 1

$$\frac{{}_6P_6}{3!2!} = \frac{720}{12} = 60$$

PTS: 2   REF: 011324a2   STA: A2.S.10   TOP: Permutations

88 ANS:

$$4xi + 5yi^8 + 6xi^3 + 2yi^4 = 4xi + 5y - 6xi + 2y = 7y - 2xi$$

PTS: 2   REF: 011433a2   STA: A2.N.7   TOP: Imaginary Numbers

89 ANS:

$y = 27.2025(1.1509)^x$. $y = 27.2025(1.1509)^{18} \approx 341$

PTS: 4 REF: 011238a2 STA: A2.S.7 TOP: Exponential Regression

90 ANS: 4

$$\frac{4 \cdot 0 + 6 \cdot 1 + 10 \cdot 2 + 0 \cdot 3 + 4k + 2 \cdot 5}{4 + 6 + 10 + 0 + k + 2} = 2$$

$$\frac{4k + 36}{k + 22} = 2$$

$$4k + 36 = 2k + 44$$

$$2k = 8$$

$$k = 4$$

PTS: 2 REF: 061221a2 STA: A2.S.3 TOP: Average Known with Missing Data

91 ANS: 3

$$x^2 + y^2 - 16x + 6y + 53 = 0$$

$$x^2 - 16x + 64 + y^2 + 6y + 9 = -53 + 64 + 9$$

$$(x - 8)^2 + (y + 3)^2 = 20$$

PTS: 2 REF: 011415a2 STA: A2.A.47 TOP: Equations of Circles

92 ANS: 3

$$3x^3 - 5x^2 - 48x + 80$$

$$x^2(3x - 5) - 16(3x - 5)$$

$$(x^2 - 16)(3x - 5)$$

$$(x + 4)(x - 4)(3x - 5)$$

PTS: 2 REF: 011317a2 STA: A2.A.7 TOP: Factoring by Grouping

93 ANS: 2

$$\frac{30}{(x + 3)(x - 3)} + \frac{(x + 3)(x - 3)}{(x + 3)(x - 3)} = \frac{5(x + 3)}{(x - 3)(x + 3)}$$ 3 is an extraneous root.

$$30 + x^2 - 9 = 5x + 15$$

$$x^2 - 5x + 6 = 0$$

$$(x - 3)(x - 2) = 0$$

$$x = 2$$

PTS: 2 REF: 061417a2 STA: A2.A.23 TOP: Solving Rationals
KEY: rational solutions

94 ANS:

$2.5 \cdot \dfrac{180}{\pi} \approx 143°14'$

PTS: 2   REF: 061431a2   STA: A2.M.2   TOP: Radian Measure
KEY: degrees

95 ANS: 4   PTS: 2   REF: 061427a2   STA: A2.A.63
TOP: Domain and Range

96 ANS: 4   PTS: 2   REF: 061318a2   STA: A2.A.49
TOP: Equations of Circles

97 ANS: 1   PTS: 2   REF: 061317a2   STA: A2.S.9
TOP: Differentiating Permutations and Combinations

98 ANS:

$\dfrac{\sqrt{3}}{2} \times \dfrac{\sqrt{2}}{2} = \dfrac{\sqrt{6}}{4}$

PTS: 2   REF: 061331a2   STA: A2.A.56   TOP: Determining Trigonometric Functions
KEY: degrees, common angles

99 ANS: 4   PTS: 2   REF: 061402a2   STA: A2.A.8
TOP: Negative and Fractional Exponents

100 ANS:

$\sigma_x = 14.9$. $\overline{x} = 40$. There are 8 scores between 25.1 and 54.9.

PTS: 4   REF: 061237a2   STA: A2.S.4   TOP: Dispersion
KEY: advanced

101 ANS: 2

$\dfrac{2\pi}{6} = \dfrac{\pi}{3}$

PTS: 2   REF: 061413a2   STA: A2.A.69
TOP: Properties of Graphs of Trigonometric Functions   KEY: period

102 ANS:

$i^{13} + i^{18} + i^{31} + n = 0$

$i + (-1) - i + n = 0$

$-1 + n = 0$

$n = 1$

PTS: 2   REF: 061228a2   STA: A2.N.7   TOP: Imaginary Numbers

103 ANS: 3

$$\sqrt[3]{6a^4b^2} + \sqrt[3]{(27 \cdot 6)a^4b^2}$$

$$a\sqrt[3]{6ab^2} + 3a\sqrt[3]{6ab^2}$$

$$4a\sqrt[3]{6ab^2}$$

PTS: 2   REF: 011319a2   STA: A2.N.2   TOP: Operations with Radicals

104 ANS:

$y = -3\sin 2x$. The period of the function is π, the amplitude is 3 and it is reflected over the *x*-axis.

PTS: 2   REF: 061235a2   STA: A2.A.72

TOP: Identifying the Equation of a Trigonometric Graph

105 ANS:
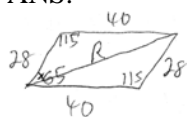
$$R = \sqrt{28^2 + 40^2 - 2(28)(40)\cos 115} \approx 58 \qquad \frac{58}{\sin 115} = \frac{40}{\sin x}$$

$$x \approx 39$$

PTS: 6   REF: 061439a2   STA: A2.A.73   TOP: Vectors

106 ANS: 2

$$\frac{5}{\sin 32} = \frac{8}{\sin E} \qquad 57.98 + 32 < 180$$

$$E \approx 57.98 \qquad (180 - 57.98) + 32 < 180$$

PTS: 2   REF: 011419a2   STA: A2.A.75   TOP: Law of Sines - The Ambiguous Case

107 ANS: 3

$$-\sqrt{2}\sec x = 2$$

$$\sec x = -\frac{2}{\sqrt{2}}$$

$$\cos x = -\frac{\sqrt{2}}{2}$$

$$x = 135, 225$$

PTS: 2   REF: 011322a2   STA: A2.A.68   TOP: Trigonometric Equations

KEY: reciprocal functions

108 ANS: 3

$$\frac{4x-5}{3} > 1 \text{ or } \frac{4x-5}{3} < -1$$

$$4x - 5 > 3 \qquad 4x - 5 < -3$$

$$4x > 8 \qquad 4x < 2$$

$$x > 2 \qquad x < \frac{1}{2}$$

PTS: 2   REF: 061209a2   STA: A2.A.1   TOP: Absolute Value Inequalities
KEY: graph

109 ANS: 4

$$\frac{10}{4} = 2.5$$

PTS: 2   REF: 011217a2   STA: A2.A.29   TOP: Sequences

110 ANS:
$$K = ab\sin C = 6 \cdot 6 \sin 50 \approx 27.6$$

PTS: 2   REF: 011429a2   STA: A2.A.74   TOP: Using Trigonometry to Find Area
KEY: Parallelograms

111 ANS: 4

$$x = 2y. \quad y^2 - (3y)^2 + 32 = 0 \quad . \quad x = 3(-2) = -6$$

$$y^2 - 9y^2 = -32$$

$$-8y^2 = -32$$

$$y^2 = 4$$

$$y = \pm 2$$

PTS: 2   REF: 061312a2   STA: A2.A.3   TOP: Quadratic-Linear Systems
KEY: equations

112 ANS: 3   PTS: 2   REF: 011422a2   STA: A2.A.54
TOP: Graphing Logarithmic Functions

113 ANS: 3

$$5000\left(1 + \frac{.03}{4}\right)^{4 \cdot 5} = 5000(1.0075)^{20} \approx 5805.92$$

PTS: 2   REF: 011410a2   STA: A2.A.12   TOP: Evaluating Exponential Expressions

114 ANS:

$$216\left(\frac{\pi}{180}\right) \approx 3.8$$

PTS: 2   REF: 061232a2   STA: A2.M.2   TOP: Radian Measure
KEY: radians

115 ANS: 3

$\dfrac{-b}{a} = \dfrac{-(-4)}{1} = 4$. If the sum is 4, the roots must be 7 and –3.

PTS: 2 REF: 011418a2 STA: A2.A.21 TOP: Roots of Quadratics
KEY: advanced

116 ANS: 4 PTS: 2 REF: 061207a2 STA: A2.A.19
TOP: Properties of Logarithms KEY: antilogarithms

117 ANS: 3 PTS: 2 REF: 061224a2 STA: A2.A.63
TOP: Domain and Range

118 ANS: 3

$\dfrac{x+16}{x-2} - \dfrac{7(x-2)}{x-2} \le 0$ $-6x + 30 = 0$ $x - 2 = 0$. Check points such that $x < 2$, $2 < x < 5$, and $x > 5$. If $x = 1$,

$\dfrac{-6x+30}{x-2} \le 0$ $\quad\quad -6x = -30 \quad\quad x = 2$

$\quad\quad\quad\quad\quad\quad\quad\quad\quad\quad x = 5$

$\dfrac{-6(1)+30}{1-2} = \dfrac{24}{-1} = -24$, which is less than 0. If $x = 3$, $\dfrac{-6(3)+30}{3-2} = \dfrac{12}{1} = 12$, which is greater than 0. If $x = 6$,

$\dfrac{-6(6)+30}{6-2} = \dfrac{-6}{4} = -\dfrac{3}{2}$, which is less than 0.

PTS: 2 REF: 011424a2 STA: A2.A.23 TOP: Rational Inequalities

119 ANS: 1 PTS: 2 REF: 011310a2 STA: A2.S.9
TOP: Differentiating Permutations and Combinations

120 ANS:

$5\csc\theta = 8$

$\csc\theta = \dfrac{8}{5}$

$\sin\theta = \dfrac{5}{8}$

$\theta \approx 141$

PTS: 2 REF: 061332a2 STA: A2.A.68 TOP: Trigonometric Equations
KEY: reciprocal functions

121 ANS: 3 PTS: 2 REF: 061306a2 STA: A2.A.72
TOP: Identifying the Equation of a Trigonometric Graph

122 ANS:

$A = 750e^{(0.03)(8)} \approx 953$

PTS: 2 REF: 061229a2 STA: A2.A.12 TOP: Evaluating Exponential Expressions

123 ANS:

$$\frac{15}{\sin 103} = \frac{a}{\sin 42}. \quad \frac{1}{2}(15)(10.3)\sin 35 \approx 44$$

$$a \approx 10.3$$

PTS: 4　　　　　REF: 061337a2　　STA: A2.A.74　　TOP: Using Trigonometry to Find Area
KEY: advanced

124 ANS:

$$K = ab\sin C = 18 \cdot 22 \sin 60 = 396\frac{\sqrt{3}}{2} = 198\sqrt{3}$$

PTS: 2　　　　　REF: 061234a2　　STA: A2.A.74　　TOP: Using Trigonometry to Find Area
KEY: Parallelograms

125 ANS:
Less than 60 inches is below 1.5 standard deviations from the mean. $0.067 \cdot 450 \approx 30$

PTS: 2　　　　　REF: 061428a2　　STA: A2.S.5　　TOP: Normal Distributions
KEY: predict

126 ANS:

$$\sec \theta \sin \theta \cot \theta = \frac{1}{\cos \theta} \cdot \sin \theta \cdot \frac{\cos \theta}{\sin \theta} = 1$$

PTS: 2　　　　　REF: 011428a2　　STA: A2.A.67　　TOP: Proving Trigonometric Identities

127 ANS: 4　　　　PTS: 2　　　　REF: 061411a2　　STA: A2.A.30
TOP: Sequences

128 ANS: 2　　　　PTS: 2　　　　REF: 061218a2　　STA: A2.A.43
TOP: Defining Functions

129 ANS: 1　　　　PTS: 2　　　　REF: 061408a2　　STA: A2.A.24
TOP: Completing the Square

130 ANS:

$$\frac{_{10}P_{10}}{3! \cdot 3! \cdot 2!} = \frac{3,628,800}{72} = 50,400$$

PTS: 2　　　　　REF: 061330a2　　STA: A2.S.10　　TOP: Permutations

131 ANS: 2
$$b^2 - 4ac = (-9)^2 - 4(2)(4) = 81 - 32 = 49$$

PTS: 2　　　　　REF: 011411a2　　STA: A2.A.2　　TOP: Using the Discriminant
KEY: determine nature of roots given equation

132 ANS: 2
$$\frac{1}{2}(22)(13)\sin 55 \approx 117$$

PTS: 2　　　　　REF: 061403a2　　STA: A2.A.74　　TOP: Using Trigonometry to Find Area
KEY: basic

133 ANS: 4

$_{15}C_5 = 3,003.$ $_{25}C_5 = {}_{25}C_{20} = 53,130.$ $_{25}C_{15} = 3,268,760.$

PTS: 2   REF: 061227a2   STA: A2.S.11   TOP: Combinations

134 ANS: 3

$$S_n = \frac{n}{2}[2a + (n-1)d] = \frac{19}{2}[2(3) + (19-1)7] = 1254$$

PTS: 2   REF: 011202a2   STA: A2.A.35   TOP: Summations

KEY: arithmetic

135 ANS: 4   PTS: 2   REF: 011406a2   STA: A2.S.1

TOP: Analysis of Data

136 ANS: 3   PTS: 2   REF: 061418a2   STA: A2.A.51

TOP: Domain and Range

137 ANS: 4
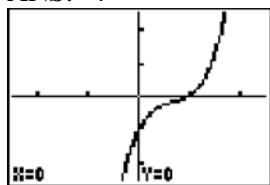
PTS: 2   REF: 061222a2   STA: A2.A.50   TOP: Solving Polynomial Equations

138 ANS:
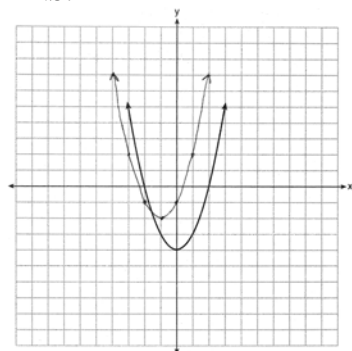
PTS: 2   REF: 061435a2   STA: A2.A.46

TOP: Transformations with Functions and Relations

139 ANS:

$$\frac{-(x^2-4)}{(x+4)(x+3)} \times \frac{x+3}{2(x-2)} = \frac{-(x+2)(x-2)}{x+4} \times \frac{1}{2(x-2)} = \frac{-(x+2)}{2(x+4)}$$

PTS: 4   REF: 061236a2   STA: A2.A.16   TOP: Multiplication and Division of Rationals

KEY: division

140 ANS: 3

$$\frac{a + \dfrac{b}{c}}{d - \dfrac{b}{c}} = \frac{\dfrac{ac+b}{c}}{\dfrac{cd-b}{c}} = \frac{ac+b}{c} \cdot \frac{c}{cd-b} = \frac{ac+b}{cd-b}$$

PTS: 2　　　　REF: 011405a2　　　STA: A2.A.17　　　TOP: Complex Fractions

141 ANS: 4

$4 + 3(2-x) + 3(3-x) + 3(4-x) + 3(5-x)$

$4 + 6 - 3x + 9 - 3x + 12 - 3x + 15 - 3x$

$46 - 12x$

PTS: 2　　　　REF: 061315a2　　　STA: A2.N.10　　　TOP: Sigma Notation
KEY: advanced

142 ANS: 2　　　　PTS: 2　　　　REF: 061205a2　　　STA: A2.A.34
TOP: Sigma Notation

143 ANS:

$\sqrt{x^2 + x - 1} = -4x + 3$　　　　$-4\left(\dfrac{2}{3}\right) + 3 \ge 0$

$x^2 + x - 1 = 16x^2 - 24x + 9$

$0 = 15x^2 - 25x + 10$　　　　$\dfrac{1}{3} \ge 0$

$0 = 3x^2 - 5x + 2$　　　　$-4(1) + 3 < 0$

$0 = (3x - 2)(x - 1)$　　　　　1 is extraneous

$x = \dfrac{2}{3},\ x \ne 1$

PTS: 6　　　　REF: 011339a2　　　STA: A2.A.22　　　TOP: Solving Radicals
KEY: extraneous solutions

144 ANS: 4

$(a-1)^2 + (a-2)^2 + (a-3)^2 + (a-4)^2$

$(a^2 - 2a + 1) + (a^2 - 4a + 4) + (a^2 - 6a + 9) + (a^2 - 8a + 16)$

$4a^2 - 20a + 30$

PTS: 2　　　　REF: 011414a2　　　STA: A2.N.10　　　TOP: Sigma Notation
KEY: advanced

145 ANS:

$y = 180.377(0.954)^x$

PTS: 2　　　　REF: 061231a2　　　STA: A2.S.7　　　TOP: Exponential Regression

146 ANS: 1　　　　PTS: 2　　　　REF: 061223a2　　　STA: A2.S.15
TOP: Binomial Probability　　　　KEY: modeling

147 ANS: 3

$$42 = \frac{1}{2}(a)(8)\sin 61$$

$$42 \approx 3.5a$$

$$12 \approx a$$

PTS: 2   REF: 011316a2   STA: A2.A.74   TOP: Using Trigonometry to Find Area
KEY: basic

148 ANS: 1

$$20(-2) = x(-2x + 2)$$

$$-40 = -2x^2 + 2x$$

$$2x^2 - 2x - 40 = 0$$

$$x^2 - x - 20 = 0$$

$$(x + 4)(x - 5) = 0$$

$$x = -4, 5$$

PTS: 2   REF: 011321a2   STA: A2.A.5   TOP: Inverse Variation

149 ANS: 2

$$\sin S = \frac{8}{17}$$

$$S = \sin^{-1}\frac{8}{17}$$

$$S \approx 28°4'$$

PTS: 2   REF: 061311a2   STA: A2.A.55   TOP: Trigonometric Ratios

150 ANS: 3

$$_6C_3\left(\frac{x}{2}\right)^3(-2y)^3 = 20 \cdot \frac{x^3}{8} \cdot -8y^3 = -20x^3y^3$$

PTS: 2   REF: 061215a2   STA: A2.A.36   TOP: Binomial Expansions

151 ANS: 3

sum of the roots, $\frac{-b}{a} = \frac{-(-9)}{4} = \frac{9}{4}$. product of the roots, $\frac{c}{a} = \frac{3}{4}$

PTS: 2   REF: 061208a2   STA: A2.A.21   TOP: Roots of Quadratics
KEY: basic

152 ANS: 1   PTS: 2   REF: 011416a2   STA: A2.A.39
TOP: Domain and Range   KEY: real domain
153 ANS: 3

$\log 4m^2 = \log 4 + \log m^2 = \log 4 + 2\log m$

PTS: 2   REF: 061321a2   STA: A2.A.19   TOP: Properties of Logarithms
KEY: splitting logs
154 ANS: 3   PTS: 2   REF: 061416a2   STA: A2.A.12
TOP: Evaluating Exponential Expressions
155 ANS: 1
(4) shows the strongest linear relationship, but if $r < 0$, $b < 0$. The Regents announced that a correct solution was not provided for this question and all students should be awarded credit.

PTS: 2   REF: 011223a2   STA: A2.S.8   TOP: Correlation Coefficient
156 ANS: 4   PTS: 1   REF: 011312a2   STA: A2.A.56
TOP: Determining Trigonometric Functions   KEY: degrees, common angles
157 ANS:

$(5x - 1)^{\frac{1}{3}} = 4$

$5x - 1 = 64$

$5x = 65$

$x = 13$

PTS: 2   REF: 061433a2   STA: A2.A.28   TOP: Logarithmic Equations
KEY: advanced
158 ANS:

$\text{Sum } \dfrac{-b}{a} = -\dfrac{1}{12}. \text{ Product } \dfrac{c}{a} = -\dfrac{1}{2}$

PTS: 2   REF: 061328a2   STA: A2.A.20   TOP: Roots of Quadratics
159 ANS: 1   PTS: 2   REF: 061316a2   STA: A2.S.8
TOP: Correlation Coefficient
160 ANS: 3

$6n^{-1} < 4n^{-1}$. Flip sign when multiplying each side of the inequality by n, since a negative number.

$\dfrac{6}{n} < \dfrac{4}{n}$

$6 > 4$

PTS: 2   REF: 061314a2   STA: A2.N.1   TOP: Negative and Fractional Exponents

161 ANS:

$$\frac{31-19}{7-4} = \frac{12}{3} = 4 \quad x + (4-1)4 = 19 \quad a_n = 7 + (n-1)4$$

$$x + 12 = 19$$

$$x = 7$$

PTS: 2   REF: 011434a2   STA: A2.A.29   TOP: Sequences

162 ANS: 1   PTS: 2   REF: 011314a2   STA: A2.N.3
     TOP: Operations with Polynomials

163 ANS:

$$\frac{27}{\sin 75} = \frac{F_1}{\sin 60}. \quad \frac{27}{\sin 75} = \frac{F_2}{\sin 45}.$$

$$F_1 \approx 24 \qquad F_2 \approx 20$$

PTS: 4   REF: 061238a2   STA: A2.A.73   TOP: Vectors

164 ANS:

$$2x - 3 > 5 \text{ or } 2x - 3 < -5$$

$$2x > 8 \qquad 2x < -2$$

$$x > 4 \qquad x < -1$$

PTS: 2   REF: 061430a2   STA: A2.A.1   TOP: Absolute Value Inequalities

165 ANS: 1

PTS: 2   REF: 061225a2   STA: A2.S.8   TOP: Correlation Coefficient

166 ANS: 2

$$\cos(x - y) = \cos x \cos y + \sin x \sin y$$

$$= b \cdot b + a \cdot a$$

$$= b^2 + a^2$$

PTS: 2   REF: 061421a2   STA: A2.A.76   TOP: Angle Sum and Difference Identities
KEY: simplifying

167 ANS:

$$x^3 + 5x^2 - 4x - 20 = 0$$

$$x^2(x + 5) - 4(x + 5) = 0$$

$$(x^2 - 4)(x + 5) = 0$$

$$(x + 2)(x - 2)(x + 5) = 0$$

$$x = \pm 2, -5$$

PTS: 4　　　REF: 061437a2　　　STA: A2.A.26　　　TOP: Solving Polynomial Equations

168 ANS: 3

$$S_8 = \frac{3(1 - (-4)^8)}{1 - (-4)} = \frac{196,605}{5} = -39,321$$

PTS: 2　　　REF: 061304a2　　　STA: A2.A.35　　　TOP: Summations
KEY: geometric

169 ANS:

$$2x - 1 = 27^{\frac{4}{3}}$$

$$2x - 1 = 81$$

$$2x = 82$$

$$x = 41$$

PTS: 2　　　REF: 061329a2　　　STA: A2.A.28　　　TOP: Logarithmic Equations
KEY: advanced

170 ANS:

$$a + 15 + 2a = 90$$

$$3a + 15 = 90$$

$$3a = 75$$

$$a = 25$$

PTS: 2　　　REF: 011330a2　　　STA: A2.A.58　　　TOP: Cofunction Trigonometric Relationships

171 ANS: 1

$$\cos(A - B) = \left(\frac{5}{13}\right)\left(-\frac{3}{5}\right) + \left(\frac{12}{13}\right)\left(\frac{4}{5}\right) = -\frac{15}{65} + \frac{48}{65} = \frac{33}{65}$$

PTS: 2　　　REF: 011214a2　　　STA: A2.A.76　　　TOP: Angle Sum and Difference Identities
KEY: evaluating

172 ANS: 4

$$x^2(x+2) - (x+2)$$

$$(x^2 - 1)(x+2)$$

$$(x+1)(x-1)(x+2)$$

PTS: 2   REF: 011426a2   STA: A2.A.7   TOP: Factoring by Grouping

173 ANS: 1   PTS: 2   REF: 011306a2   STA: A2.A.8
TOP: Negative and Fractional Exponents

174 ANS: 2   PTS: 2   REF: 011417a2   STA: A2.S.9
TOP: Differentiating Permutations and Combinations

175 ANS: 2

$$\frac{\cot x}{\csc x} = \frac{\frac{\cos x}{\sin x}}{\frac{1}{\sin x}} = \cos x$$

PTS: 2   REF: 061410a2   STA: A2.A.58   TOP: Reciprocal Trigonometric Relationships

176 ANS: 3

$$(3i)(2i)^2(m+i)$$

$$(3i)(4i^2)(m+i)$$

$$(3i)(-4)(m+i)$$

$$(-12i)(m+i)$$

$$-12mi - 12i^2$$

$$-12mi + 12$$

PTS: 2   REF: 061319a2   STA: A2.N.9
TOP: Multiplication and Division of Complex Numbers

177 ANS: 3

$$1000 = 500e^{.05t}$$

$$2 = e^{.05t}$$

$$\ln 2 = \ln e^{.05t}$$

$$\frac{\ln 2}{.05} = \frac{.05t \cdot \ln e}{.05}$$

$$13.9 \approx t$$

PTS: 2   REF: 061313a2   STA: A2.A.6   TOP: Exponential Growth

x

186 ANS:
$_{25}C_{20} = 53,130$

PTS: 2　　　　REF: 011232a2　　STA: A2.S.11　　TOP: Combinations
187 ANS: 1
$\frac{1}{2}(7.4)(3.8)\sin 126 \approx 11.4$

PTS: 2　　　　REF: 011218a2　　STA: A2.A.74　　TOP: Using Trigonometry to Find Area
KEY: basic
188 ANS:
$\sqrt{27^2 + 32^2 - 2(27)(32)\cos 132} \approx 54$

PTS: 4　　　　REF: 011438a2　　STA: A2.A.73　　TOP: Law of Cosines
KEY: applied
189 ANS:
$_5C_4 \cdot 0.28^4 \cdot 0.72^1 +_5 C_5 \cdot 0.28^5 \cdot 0.72^0 \approx 0.024$

PTS: 4　　　　REF: 011437a2　　STA: A2.S.15　　TOP: Binomial Probability
KEY: at least or at most
190 ANS:
$3 - 2x \geq 7$　or　$3 - 2x \leq -7$

$-2x \geq 4$　　　　$-2x \leq -10$

$x \leq -2$　　　　$x \geq 5$

PTS: 2　　　　REF: 011334a2　　STA: A2.A.1　　TOP: Absolute Value Inequalities
KEY: graph
191 ANS: 4　　　　PTS: 2　　　　REF: 011201a2　　STA: A2.S.2
TOP: Analysis of Data
192 ANS:
$a_n = 9n - 4$　　　　. $S_n = \frac{20(5 + 176)}{2} = 1810$

$a_1 = 9(1) - 4 = 5$

$a_{20} = 9(20) - 4 = 176$

PTS: 2　　　　REF: 011328a2　　STA: A2.A.35　　TOP: Summations
KEY: arithmetic
193 ANS: 2　　　　PTS: 2　　　　REF: 011208a2　　STA: A2.A.67
TOP: Simplifying Trigonometric Expressions
194 ANS: 4
$(x + i)^2 - (x - i)^2 = x^2 + 2xi + i^2 - (x^2 - 2xi + i^2) = 4xi$

PTS: 2　　　　REF: 011327a2　　STA: A2.N.9
TOP: Multiplication and Division of Complex Numbers

195 ANS: 4   PTS: 2   REF: 011409a2   STA: A2.S.10
TOP: Permutations

196 ANS: 3
If $\csc P > 0$, $\sin P > 0$. If $\cot P < 0$ and $\sin P > 0$, $\cos P < 0$

PTS: 2   REF: 061320a2   STA: A2.A.60   TOP: Finding the Terminal Side of an Angle

197 ANS: 1   PTS: 2   REF: 011402a2   STA: A2.A.8
TOP: Negative and Fractional Exponents

198 ANS:
$r = \sqrt{2^2 + 3^2} = \sqrt{13}$. $(x+5)^2 + (y-2)^2 = 13$

PTS: 2   REF: 011234a2   STA: A2.A.49   TOP: Writing Equations of Circles

199 ANS: 3   PTS: 2   REF: 061308ge   STA: A2.A.51
TOP: Domain and Range

200 ANS: 2   PTS: 2   REF: 011407a2   STA: A2.A.43
TOP: Defining Functions

201 ANS:
$$x(x+3) = 10$$
$$x^2 + 3x - 10 = 0$$
$$(x+5)(x-2) = 0$$
$$x = -5, 2$$

PTS: 2   REF: 011431a2   STA: A2.A.3   TOP: Quadratic-Linear Systems
KEY: equations

202 ANS: 4   PTS: 2   REF: 011323a2   STA: A2.A.2
TOP: Using the Discriminant   KEY: determine nature of roots given equation

203 ANS: 1   PTS: 2   REF: 061409a2   STA: A2.A.38
TOP: Defining Functions   KEY: graphs

204 ANS: 2
$$\bar{x} \pm \sigma$$
$$153 \pm 22$$
$$131 - 175$$

PTS: 2   REF: 011307a2   STA: A2.S.5   TOP: Normal Distributions
KEY: interval

205 ANS: 4
$$2x^2 - 7x - 5 = 0$$
$$\frac{c}{a} = \frac{-5}{2}$$

PTS: 2   REF: 061414a2   STA: A2.A.20   TOP: Roots of Quadratics

206 ANS: 4
$\sin(\theta + 90) = \sin\theta \cdot \cos 90 + \cos\theta \cdot \sin 90 = \sin\theta \cdot (0) + \cos\theta \cdot (1) = \cos\theta$

PTS: 2   REF: 061309a2   STA: A2.A.76   TOP: Angle Sum and Difference Identities
KEY: identities

207 ANS:

$2\sin^2 x + 5\sin x - 3 = 0$

$(2\sin x - 1)(\sin x + 3) = 0$

$$\sin x = \frac{1}{2}$$

$$x = \frac{\pi}{6}, \frac{5\pi}{6}$$

PTS: 4   REF: 011436a2   STA: A2.A.68   TOP: Trigonometric Equations
KEY: quadratics

208 ANS:

$83°50' \cdot \dfrac{\pi}{180} \approx 1.463$ radians $s = \theta\, r = 1.463 \cdot 12 \approx 17.6$

PTS: 2   REF: 011435a2   STA: A2.A.61   TOP: Arc Length
KEY: arc length

209 ANS:

$\dfrac{2\sqrt{3}}{3}$. If $\sin 60 = \dfrac{\sqrt{3}}{2}$, then $\csc 60 = \dfrac{2}{\sqrt{3}} \cdot \dfrac{\sqrt{3}}{\sqrt{3}} = \dfrac{2\sqrt{3}}{3}$

PTS: 2   REF: 011235a2   STA: A2.A.59   TOP: Reciprocal Trigonometric Relationships

210 ANS: 2

$$\frac{1 - \dfrac{4}{x}}{1 - \dfrac{2}{x} - \dfrac{8}{x^2}} \times \frac{x^2}{x^2} = \frac{x^2 - 4x}{x^2 - 2x - 8} = \frac{x(x-4)}{(x-4)(x+2)} = \frac{x}{x+2}$$

PTS: 2   REF: 061305a2   STA: A2.A.17   TOP: Complex Fractions

211 ANS: 3

$\dfrac{4}{-2} = -2$

PTS: 2   REF: 011304a2   STA: A2.A.31   TOP: Sequences

212 ANS: 1

$$\frac{6}{\sin 35} = \frac{10}{\sin N}$$

$$N \approx 73$$

$$73 + 35 < 180$$

$$(180 - 73) + 35 < 180$$

PTS: 2   REF: 061226a2   STA: A2.A.75   TOP: Law of Sines - The Ambiguous Case

213 ANS:

$$\sec x = \sqrt{2}$$

$$\cos x = \frac{1}{\sqrt{2}}$$

$$\cos x = \frac{\sqrt{2}}{2}$$

$$x = 45°, 315°$$

PTS: 2   REF: 061434a2   STA: A2.A.68   TOP: Trigonometric Equations
KEY: reciprocal functions

214 ANS: 3

$$\sqrt[3]{4^3 a^{15} a} = 4a^5 \sqrt[3]{a}$$

PTS: 2   REF: 061204a2   STA: A2.A.13   TOP: Simplifying Radicals
KEY: index > 2

215 ANS:

$$\frac{1 + \frac{3}{x}}{1 - \frac{5}{x} - \frac{24}{x^2}} \cdot \frac{x^2}{x^2} = \frac{x^2 + 3x}{x^2 - 5x - 24} = \frac{x(x+3)}{(x-8)(x+3)} = \frac{x}{x-8}$$

PTS: 4   REF: 061436a2   STA: A2.A.17   TOP: Complex Fractions

216 ANS: 4

$$\frac{x^2 + 9x - 22}{x^2 - 121} \div (2 - x) = \frac{(x+11)(x-2)}{(x+11)(x-11)} \cdot \frac{-1}{x-2} = \frac{-1}{x-11}$$

PTS: 2   REF: 011423a2   STA: A2.A.16   TOP: Multiplication and Division of Rationals
KEY: Division

217 ANS: 3   PTS: 2   REF: 061407a2   STA: A2.N.3
TOP: Operations with Polynomials

218 ANS:

$$_7C_3\left(\frac{1}{4}\right)^3\left(\frac{3}{4}\right)^4 = 35\left(\frac{1}{64}\right)\left(\frac{81}{256}\right) = \frac{2835}{16384} \approx 0.173$$

PTS: 2 REF: 061335a2 STA: A2.S.15 TOP: Binomial Probability
KEY: exactly

219 ANS: 2

$2^2 \cdot 3 = 12$. $6^2 d = 12$

$4^2 \cdot \frac{3}{4} = 12$ $\quad 36d = 12$

$\qquad\qquad d = \frac{1}{3}$

PTS: 2 REF: 061310a2 STA: A2.A.5 TOP: Inverse Variation

220 ANS:

$\log_{(x+3)}(2x+3)(x+5) = 2$ $\qquad\qquad$ −6 is extraneous

$$(x+3)^2 = (2x+3)(x+5)$$

$$x^2 + 6x + 9 = 2x^2 + 13x + 15$$

$$x^2 + 7x + 6 = 0$$

$$(x+6)(x+1) = 0$$

$$x = -1$$

PTS: 6 REF: 011439a2 STA: A2.A.28 TOP: Logarithmic Equations
KEY: applying properties of logarithms

221 ANS: 4

$$\frac{x}{x-\sqrt{x}} \times \frac{x+\sqrt{x}}{x+\sqrt{x}} = \frac{x^2 + x\sqrt{x}}{x^2 - x} = \frac{x(x+\sqrt{x})}{x(x-1)} = \frac{x+\sqrt{x}}{x-1}$$

PTS: 2 REF: 061325a2 STA: A2.A.15 TOP: Rationalizing Denominators
KEY: index = 2

222 ANS: 3

$$_8C_3 \cdot x^{8-3} \cdot (-2)^3 = 56x^5 \cdot (-8) = -448x^5$$

PTS: 2 REF: 011308a2 STA: A2.A.36 TOP: Binomial Expansions

223 ANS: 2

$x^3 + 3x^2 - 4x - 12$

$x^2(x+3) - 4(x+3)$

$(x^2 - 4)(x+3)$

$(x+2)(x-2)(x+3)$

PTS: 2 REF: 061214a2 STA: A2.A.7 TOP: Factoring by Grouping

224 ANS:

$3x^2 - 11x + 6 = 0.$ Sum $\dfrac{-b}{a} = \dfrac{11}{3}.$ Product $\dfrac{c}{a} = \dfrac{6}{3} = 2$

PTS: 2   REF: 011329a2   STA: A2.A.20   TOP: Roots of Quadratics
225 ANS: 2   PTS: 2   REF: 011213a2   STA: A2.N.8
TOP: Conjugates of Complex Numbers
226 ANS: 3
$34.1\% + 19.1\% = 53.2\%$

PTS: 2   REF: 011212a2   STA: A2.S.5   TOP: Normal Distributions
KEY: probability
227 ANS: 1

If $\sin x = 0.8$, then $\cos x = 0.6.$ $\tan \dfrac{1}{2} x = \sqrt{\dfrac{1-0.6}{1+0.6}} = \sqrt{\dfrac{0.4}{1.6}} = 0.5.$

PTS: 2   REF: 061220a2   STA: A2.A.77   TOP: Half Angle Identities
228 ANS:
Ordered, the heights are 71, 71, 72, 74, 74, 75, 78, 79, 79, 83. $Q_1 = 72$ and $Q_3 = 79.$ $79 - 72 = 7.$

PTS: 2   REF: 011331a2   STA: A2.S.4   TOP: Dispersion
KEY: range, quartiles, interquartile range, variance
229 ANS: 1
$\dfrac{2\pi}{b} = 4\pi$

$b = \dfrac{1}{2}$

PTS: 2   REF: 011425a2   STA: A2.A.69
TOP: Properties of Graphs of Trigonometric Functions   KEY: period
230 ANS: 2   PTS: 2   REF: 011225a2   STA: A2.A.43
TOP: Defining Functions
231 ANS: 1   PTS: 2   REF: 061401a2   STA: A2.S.2
TOP: Analysis of Data
232 ANS: 1
$(4a + 4) - (2a + 1) = 2a + 3$

PTS: 2   REF: 011401a2   STA: A2.A.30   TOP: Sequences
233 ANS: 2   PTS: 2   REF: 061301a2   STA: A2.S.1
TOP: Analysis of Data
234 ANS: 3
$_3C_1 \cdot {}_5C_2 = 3 \cdot 10 = 30$

PTS: 2   REF: 061422a2   STA: A2.S.12   TOP: Combinations
235 ANS: 2   PTS: 2   REF: 011507a2   STA: A2.A.38
TOP: Defining Functions   KEY: graphs

236 ANS: 3
$_{20}C_4 = 4,845$

PTS: 2   REF: 011509a2   STA: A2.S.11   TOP: Combinations

Algebra 2/Trigonometry Regents at Random

237 In $\triangle FGH$, $f = 6$, $g = 9$, and $m\angle H = 57$. Which statement can be used to determine the numerical value of h?

1) $h^2 = 6^2 + 9^2 - 2(9)(h)\cos 57°$
2) $h^2 = 6^2 + 9^2 - 2(6)(9)\cos 57°$
3) $6^2 = 9^2 + h^2 - 2(9)(h)\cos 57°$
4) $9^2 = 6^2 + h^2 - 2(6)(h)\cos 57°$

238 The table of values below can be modeled by which equation?

| x	y
-2	5
-1	4
0	3
1	4
2	5

1) $f(x) = |x + 3|$
2) $f(x) = |x| + 3$
3) $f(y) = |y + 3|$
4) $f(y) = |y| + 3$

239 The equation $\log_a x = y$ where $x > 0$ and $a > 1$ is equivalent to

1) $x^y = a$
2) $y^a = x$
3) $a^y = x$
4) $a^x = y$

240 An investment is earning 5% interest compounded quarterly. The equation represents the total amount of money, A, where P is the original investment, r is the interest rate, t is the number of years, and n represents the number of times per year the money earns interest. Which graph could represent this investment over at least 50 years?

1)

2)

3)

4)
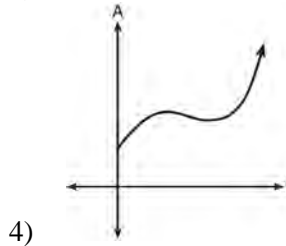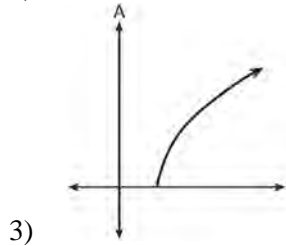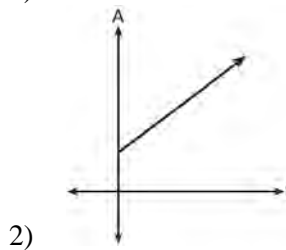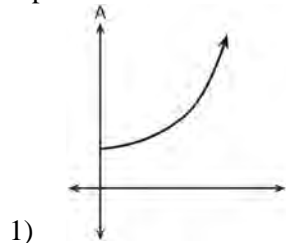
241 Which equation has real, rational, and unequal roots?
1) $x^2 + 10x + 25 = 0$
2) $x^2 - 5x + 4 = 0$
3) $x^2 - 3x + 1 = 0$
4) $x^2 - 2x + 5 = 0$

242 The common ratio of the sequence $-\dfrac{1}{2}, \dfrac{3}{4}, -\dfrac{9}{8}$ is
1) $-\dfrac{3}{2}$
2) $-\dfrac{2}{3}$
3) $-\dfrac{1}{2}$
4) $-\dfrac{1}{4}$

243 If $\sin A = \dfrac{3}{8}$, what is the value of $\cos 2A$?
1) $-\dfrac{9}{64}$
2) $\dfrac{1}{4}$
3) $\dfrac{23}{32}$
4) $\dfrac{55}{64}$

244 When factored completely, the expression $x^3 - 2x^2 - 9x + 18$ is equivalent to
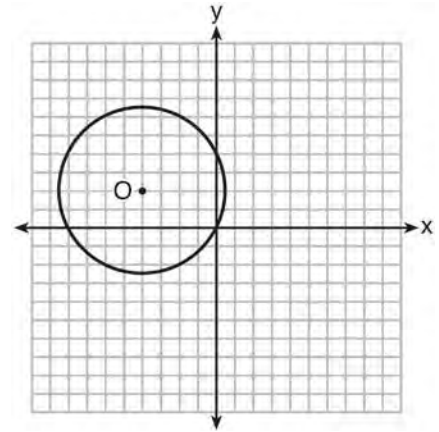1) $(x^2 - 9)(x - 2)$
2) $(x - 2)(x - 3)(x + 3)$
3) $(x - 2)^2(x - 3)(x + 3)$
4) $(x - 3)^2(x - 2)$

245 When $-3 - 2i$ is multiplied by its conjugate, the result is
1) -13
2) -5
3) 5
4) 13

246 A circle with center O and passing through the origin is graphed below.

What is the equation of circle O?
1) $x^2 + y^2 = 2\sqrt{5}$
2) $x^2 + y^2 = 20$
3) $(x + 4)^2 + (y - 2)^2 = 2\sqrt{5}$
4) $(x + 4)^2 + (y - 2)^2 = 20$

247 What is the product of the roots of $4x^2 - 5x = 3$?
1) $\dfrac{3}{4}$
2) $\dfrac{5}{4}$
3) $-\dfrac{3}{4}$
4) $-\dfrac{5}{4}$

248 Which expression is equivalent to the sum of the sequence $6, 12, 20, 30$?

1) $\sum_{n=4}^{7} 2^n - 10$

2) $\sum_{n=3}^{6} \frac{2n^2}{3}$

3) $\sum_{n=2}^{5} 5n - 4$

4) $\sum_{n=2}^{5} n^2 + n$

249 Which expression is equivalent to $(5^{-2}a^3 b^{-4})^{-1}$?

1) $\dfrac{10b^4}{a^3}$

2) $\dfrac{25b^4}{a^3}$

3) $\dfrac{a^3}{25b^4}$

4) $\dfrac{a^2}{125b^5}$

250 Which trigonometric expression does *not* simplify to 1?

1) $\sin^2 x(1+\cot^2 x)$

2) $\sec^2 x(1-\sin^2 x)$

3) $\cos^2 x(\tan^2 x - 1)$

4) $\cot^2 x(\sec^2 x - 1)$

251 What is the product of $\sqrt[3]{4a^2 b^4}$ and $\sqrt[3]{16a^3 b^2}$?

1) $4ab^2 \sqrt[3]{a^2}$

2) $4a^2 b^3 \sqrt[3]{a}$

3) $8ab^2 \sqrt[3]{a^2}$

4) $8a^2 b^3 \sqrt[3]{a}$

252 How many different 11-letter arrangements are possible using the letters in the word "ARRANGEMENT"?

1) 2,494,800

2) 4,989,600

3) 19,958,400

4) 39,916,800

253 What is the third term in the expansion of $(2x-3)^5$?

1) $720x^3$

2) $180x^3$

3) $-540x^2$

4) $-1080x^2$

254 Angle θ is in standard position and $(-4, 0)$ is a point on the terminal side of θ. What is the value of $\sec \theta$?

1) -4

2) -1

3) 0

4) undefined

255 The domain of $f(x) = -\dfrac{3}{\sqrt{2-x}}$ is the set of all real numbers
1) greater than 2
2) less than 2
3) except 2
4) between −2 and 2

256 Which equation could be used to solve $\dfrac{5}{x-3} - \dfrac{2}{x} = 1$?
1) $x^2 - 6x - 3 = 0$
2) $x^2 - 6x + 3 = 0$
3) $x^2 - 6x - 6 = 0$
4) $x^2 - 6x + 6 = 0$

257 How many distinct triangles can be constructed if $m\angle A = 30$, side $a = \sqrt{34}$, and side $b = 12$?
1) one acute triangle
2) one obtuse triangle
3) two triangles
4) none

258 The expression $\left(\dfrac{3}{2}x + 1\right)\left(\dfrac{3}{2}x - 1\right) - \left(\dfrac{3}{2}x - 1\right)^2$ is equivalent to
1) 0
2) $-3x$
3) $\dfrac{3}{4}x - 2$
4) $3x - 2$

259 The table below shows five numbers and their frequency of occurrence.

Number	Frequency
5	9
7	5
8	8
12	8
14	8

The interquartile range for these data is
1) 7
2) 5
3) 7 to 12
4) 6 to 13

260 A wheel has a radius of 18 inches. Which distance, to the *nearest inch*, does the wheel travel when it rotates through an angle of $\dfrac{2\pi}{5}$ radians?
1) 45
2) 23
3) 13
4) 11

261 If $f(x) = 4x^2 - x + 1$, then $f(a + 1)$ equals
1) $4a^2 - a + 6$
2) $4a^2 - a + 4$
3) $4a^2 + 7a + 6$
4) $4a^2 + 7a + 4$

262 If p and q vary inversely and p is 25 when q is 6, determine q when p is equal to 30.

263 Express in simplest form: $\dfrac{\dfrac{36-x^2}{(x+6)^2}}{\dfrac{x-3}{x^2+3x-18}}$

264 Solve $e^{4x} = 12$ algebraically for x, rounded to the *nearest hundredth*.

265 Determine, to the *nearest minute*, the degree measure of an angle of $\dfrac{5}{11}\pi$ radians.

266 The probability of Ashley being the catcher in a softball game is $\dfrac{2}{5}$. Calculate the exact probability that she will be the catcher in *exactly* five of the next six games.

267 If x is a real number, express $2xi(i - 4i^2)$ in simplest $a + bi$ form.

268 On a test that has a normal distribution of scores, a score of 57 falls one standard deviation below the mean, and a score of 81 is two standard deviations above the mean. Determine the mean score of this test.

269 The area of a parallelogram is 594, and the lengths of its sides are 32 and 46. Determine, to the *nearest tenth of a degree*, the measure of the acute angle of the parallelogram.

270 The table below shows the amount of a decaying radioactive substance that remained for selected years after 1990.

Years After 1990 (x)	0	2	5	9	14	17	19
Amount (y)	750	451	219	84	25	12	8

Write an exponential regression equation for this set of data, rounding all values to the *nearest thousandth*. Using this equation, determine the amount of the substance that remained in 2002, to the *nearest integer*.

271 The periodic graph below can be represented by the trigonometric equation $y = a\cos bx + c$ where a, b, and c are real numbers.
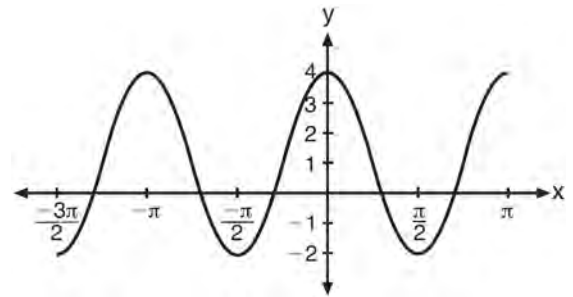
State the values of a, b, and c, and write an equation for the graph.

272 Use the recursive sequence defined below to express the next three terms as fractions reduced to lowest terms.

$$a_1 = 2$$

$$a_n = 3\left(a_{n-1}\right)^{-2}$$

273 A homeowner wants to increase the size of a rectangular deck that now measures 14 feet by 22 feet. The building code allows for a deck to have a maximum area of 800 square feet. If the length and width are increased by the same number of feet, find the maximum number of whole feet each dimension can be increased and *not* exceed the building code. [Only an algebraic solution can receive full credit.]

274 Which list of ordered pairs does *not* represent a one-to-one function?
1) $(1,-1),(2,0),(3,1),(4,2)$
2) $(1,2),(2,3),(3,4),(4,6)$
3) $(1,3),(2,4),(3,3),(4,1)$
4) $(1,5),(2,4),(3,1),(4,0)$

275 Which expression is equivalent to $\dfrac{x^{-1}y^2}{x^2y^{-4}}$?

1) $\dfrac{x}{y^2}$

2) $\dfrac{x^3}{y^6}$

3) $\dfrac{y^2}{x}$

4) $\dfrac{y^6}{x^3}$

276 The terminal side of an angle measuring $\dfrac{4\pi}{5}$ radians lies in Quadrant
1) I
2) II
3) III
4) IV

277 If $f(x) = 2x^2 + 1$ and $g(x) = 3x - 2$, what is the value of $f(g(-2))$?
1) -127
2) -23
3) 25
4) 129

278 The expression $\sqrt[3]{27a^3} \cdot \sqrt[4]{16b^8}$ is equivalent to
1) $6ab^2$
2) $6ab^4$
3) $12ab^2$
4) $12ab^4$

279 If $x^2 = 12x - 7$ is solved by completing the square, one of the steps in the process is
1) $(x-6)^2 = -43$
2) $(x+6)^2 = -43$
3) $(x-6)^2 = 29$
4) $(x+6)^2 = 29$

280 Given the equation $3x^2 + 2x + k = 0$, state the sum and product of the roots.

281 What is the solution of the inequality $9 - x^2 < 0$?
1) $\{x | -3 < x < 3\}$
2) $\{x | x > 3 \text{ or } x < -3\}$
3) $\{x | x > 3\}$
4) $\{x | x < -3\}$

282 What is the area of a parallelogram that has sides measuring 8 cm and 12 cm and includes an angle of 120°?
1) $24\sqrt{3}$
2) $48\sqrt{3}$
3) $83\sqrt{3}$
4) $96\sqrt{3}$

283 The expression $\dfrac{5}{4 - \sqrt{11}}$ is equivalent to
1) $4 + \sqrt{11}$
2) $\dfrac{20 + 5\sqrt{11}}{27}$
3) $4 - \sqrt{11}$
4) $\dfrac{20 - 5\sqrt{11}}{27}$

284 Given y varies inversely as x, when y is multiplied by $\dfrac{1}{2}$, then x is multiplied by
1) $\dfrac{1}{2}$
2) 2
3) $-\dfrac{1}{2}$
4) -2

285 What is the total number of different nine-letter arrangements that can be formed using the letters in the word "TENNESSEE"?
1) 3,780
2) 15,120
3) 45,360
4) 362,880

286 What is the fourth term of the sequence defined by
$$a_1 = 3xy^5$$
$$a_n = \left(\frac{2x}{y}\right) a_{n-1}?$$
1) $12x^3 y^3$
2) $24x^2 y^4$
3) $24x^4 y^2$
4) $48x^5 y$

287 What is the solution set of $|x - 2| = 3x + 10$?
1) $\{\ \}$
2) $\{-2\}$
3) $\{-6\}$
4) $\{-2, -6\}$

288 When $\dfrac{7}{8}x^2 - \dfrac{3}{4}x$ is subtracted from $\dfrac{5}{8}x^2 - \dfrac{1}{4}x + 2$, the difference is
1) $-\dfrac{1}{4}x^2 - x + 2$
2) $\dfrac{1}{4}x^2 - x + 2$
3) $-\dfrac{1}{4}x^2 + \dfrac{1}{2}x + 2$
4) $\dfrac{1}{4}x^2 - \dfrac{1}{2}x - 2$

39

289 By law, a wheelchair service ramp may be inclined no more than 4.76°. If the base of a ramp begins 15 feet from the base of a public building, which equation could be used to determine the maximum height, h, of the ramp where it reaches the building's entrance?

1) $\sin 4.76° = \dfrac{h}{15}$

2) $\sin 4.76° = \dfrac{15}{h}$

3) $\tan 4.76° = \dfrac{h}{15}$

4) $\tan 4.76° = \dfrac{15}{h}$

290 Which transformation of $y = f(x)$ moves the graph 7 units to the left and 3 units down?
1) $y = f(x + 7) - 3$
2) $y = f(x + 7) + 3$
3) $y = f(x - 7) - 3$
4) $y = f(x - 7) + 3$

291 If $\log x = 2 \log a + \log b$, then x equals
1) $a^2 b$
2) $2ab$
3) $a^2 + b$
4) $2a + b$

292 A theater has 35 seats in the first row. Each row has four more seats than the row before it. Which expression represents the number of seats in the nth row?
1) $35 + (n + 4)$
2) $35 + (4n)$
3) $35 + (n + 1)(4)$
4) $35 + (n - 1)(4)$

293 Which value is in the domain of the function graphed below, but is *not* in its range?
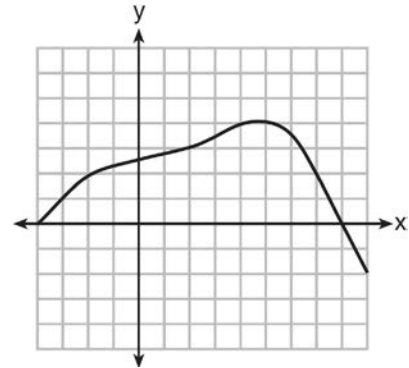
1) 0
2) 2
3) 3
4) 7

294 How many full cycles of the function $y = 3 \sin 2x$ appear in π radians?
1) 1
2) 2
3) 3
4) 4

295 A video-streaming service can choose from six half-hour shows and four one-hour shows. Which expression could be used to calculate the number of different ways the service can choose four half-hour shows and two one-hour shows?
1) $_6P_4 \cdot {}_4P_2$
2) $_6P_4 + {}_4P_2$
3) $_6C_4 \cdot {}_4C_2$
4) $_6C_4 + {}_4C_2$

296 What is the inverse of the function $f(x) = \log_4 x$?

1) $f^{-1}(x) = x^4$
2) $f^{-1}(x) = 4^x$
3) $f^{-1}(x) = \log_x 4$
4) $f^{-1}(x) = -\log_x 4$

297 The expression $\dfrac{1 + \cos 2A}{\sin 2A}$ is equivalent to

1) $\cot A$
2) $\tan A$
3) $\sec A$
4) $1 + \cot 2A$

298 The roots of $3x^2 + x = 14$ are

1) imaginary
2) real, rational, and equal
3) real, rational, and unequal
4) real, irrational, and unequal

299 Circle O has a radius of 2 units. An angle with a measure of $\dfrac{\pi}{6}$ radians is in standard position. If the terminal side of the angle intersects the circle at point B, what are the coordinates of B?

1) $\left(\dfrac{\sqrt{3}}{2}, \dfrac{1}{2} \right)$

2) $\left(\sqrt{3}, 1 \right)$

3) $\left(\dfrac{1}{2}, \dfrac{\sqrt{3}}{2} \right)$

4) $\left(1, \sqrt{3} \right)$

300 What is the value of $\displaystyle\sum_{x=0}^{2} (3 - 2a)^x$?

1) $4a^2 - 2a + 12$
2) $4a^2 - 2a + 13$
3) $4a^2 - 14a + 12$
4) $4a^2 - 14a + 13$

301 A population, $p(x)$, of wild turkeys in a certain area is represented by the function $p(x) = 17(1.15)^{2x}$, where x is the number of years since 2010. How many more turkeys will be in the population for the year 2015 than 2010?

1) 46
2) 49
3) 51
4) 68

302 Solve algebraically for x: $5^{4x} = 125^{x-1}$

303 In triangle ABC, determine the number of distinct triangles that can be formed if $m\angle A = 85$, side $a = 8$, and side $c = 2$. Justify your answer.

304 The probability that Kay and Joseph Dowling will have a redheaded child is 1 out of 4. If the Dowlings plan to have three children, what is the *exact* probability that only one child will have red hair?
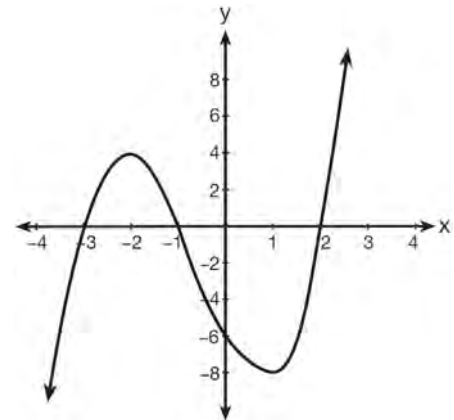
305 If $\log_{(x+1)} 64 = 3$, find the value of x.

306 The table below shows the final examination scores for Mr. Spear's class last year.

Test Score	Frequency
72	1
76	1
79	4
83	5
85	7
88	5
94	3

Find the population standard deviation based on these data, to the *nearest hundredth*. Determine the number of students whose scores are within one population standard deviation of the mean.

307 Factor completely: $x^3 - 6x^2 - 25x + 150$

308 Express $xi^8 - yi^6$ in simplest form.

309 Determine which set of data given below has the stronger linear relationship between x and y. Justify your choice.

Set A	x	1	2	3	4	5	6
	y	24	30	36	51	70	86

Set B	x	1	2	3	4	5	6
	y	81	64	49	36	25	16

310 Find the measure of the smallest angle, to the *nearest degree*, of a triangle whose sides measure 28, 47, and 34.

311 Solve algebraically for x: $\dfrac{3}{x} + \dfrac{x}{x+2} = -\dfrac{2}{x+2}$

312 In the interval $0° \le \theta < 360°$, solve the equation $5\cos\theta = 2\sec\theta - 3$ algebraically for all values of θ, to the *nearest tenth of a degree*.

313 What are the zeros of the polynomial function graphed below?

1) $\{-3,-1,2\}$
2) $\{3,1,-2\}$
3) $\{4,-8\}$
4) $\{-6\}$

314 Determine, to the *nearest minute*, the number of degrees in an angle whose measure is 2.5 radians.

315 A study compared the number of years of education a person received and that person's average yearly salary. It was determined that the relationship between these two quantities was linear and the correlation coefficient was 0.91. Which conclusion can be made based on the findings of this study?
1) There was a weak relationship.
2) There was a strong relationship.
3) There was no relationship.
4) There was an unpredictable relationship.

316 What is the value of $4x^{\frac{1}{2}} + x^0 + x^{-\frac{1}{4}}$ when $x = 16$?

1) $7\frac{1}{2}$

2) $9\frac{1}{2}$

3) $16\frac{1}{2}$

4) $17\frac{1}{2}$

317 The expression $\sqrt[4]{81x^2y^5}$ is equivalent to

1) $3x^{\frac{1}{2}}y^{\frac{5}{4}}$

2) $3x^{\frac{1}{2}}y^{\frac{4}{5}}$

3) $9xy^{\frac{5}{2}}$

4) $9xy^{\frac{2}{5}}$

318 The exact value of csc 120° is

1) $\dfrac{2\sqrt{3}}{3}$

2) 2

3) $-\dfrac{2\sqrt{3}}{3}$

4) -2

319 Which statement about the equation $3x^2 + 9x - 12 = 0$ is true?
1) The product of the roots is -12.
2) The product of the roots is -4.
3) The sum of the roots is 3.
4) The sum of the roots is -9.

320 A scholarship committee rewards the school's top math students. The amount of money each winner receives is inversely proportional to the number of scholarship recipients. If there are three winners, they each receive $400. If there are eight winners, how much money will each winner receive?
1) $1067
2) $400
3) $240
4) $150

321 What is the value of $\tan\left(\text{Arc cos }\dfrac{15}{17}\right)$?

1) $\dfrac{8}{15}$

2) $\dfrac{8}{17}$

3) $\dfrac{15}{8}$

4) $\dfrac{17}{8}$

322 The table below displays the number of siblings of each of the 20 students in a class.

Number of Siblings	Frequency
0	2
1	5
2	7
3	4
4	2

What is the population standard deviation, to the *nearest hundredth*, for this group?
1) 1.11
2) 1.12
3) 1.14
4) 1.15

323 Yusef deposits $50 into a savings account that pays 3.25% interest compounded quarterly. The amount, A, in his account can be determined by the formula $A = P\left(1 + \dfrac{r}{n}\right)^{nt}$, where P is the initial amount invested, r is the interest rate, n is the number of times per year the money is compounded, and t is the number of years for which the money is invested. What will his investment be worth in 12 years if he makes no other deposits or withdrawals?
1) $55.10
2) $73.73
3) $232.11
4) $619.74

324 Solve for x: $\dfrac{1}{16} = 2^{3x-1}$

325 An arithmetic sequence has a first term of 10 and a sixth term of 40. What is the 20th term of this sequence?
1) 105
2) 110
3) 124
4) 130

326 How many distinct ways can the eleven letters in the word "TALLAHASSEE" be arranged?
1) 831,600
2) 1,663,200
3) 3,326,400
4) 5,702,400

327 A customer will select three different toppings for a supreme pizza. If there are nine different toppings to choose from, how many different supreme pizzas can be made?
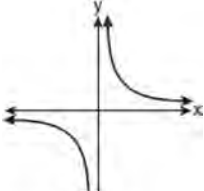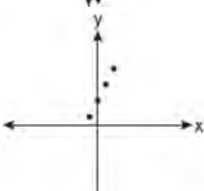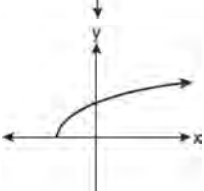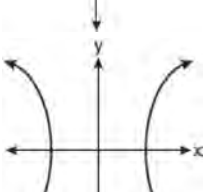1) 12
2) 27
3) 84
4) 504

328 Which values of x in the interval $0° \le x < 360°$ satisfy the equation $2\sin^2 x + \sin x - 1 = 0$?
1) $\{30°, 270°\}$
2) $\{30°, 150°, 270°\}$
3) $\{90°, 210°, 330°\}$
4) $\{90°, 210°, 270°, 330°\}$

329 Expressed as a function of a positive acute angle, $\sin 230°$ is equal to
1) $-\sin 40°$
2) $-\sin 50°$
3) $\sin 40°$
4) $\sin 50°$

330 Which equation represents a circle with its center at $(2,-3)$ and that passes through the point $(6,2)$?
1) $(x-2)^2 + (y+3)^2 = \sqrt{41}$
2) $(x+2)^2 + (y-3)^2 = \sqrt{41}$
3) $(x-2)^2 + (y+3)^2 = 41$
4) $(x+2)^2 + (y-3)^2 = 41$

331 What is the domain of the function $g(x) = 3^x - 1$?
1) $(-\infty, 3]$
2) $(-\infty, 3)$
3) $(-\infty, \infty)$
4) $(-1, \infty)$

332 The expression $\dfrac{3-\sqrt{8}}{\sqrt{3}}$ is equivalent to
1) $\dfrac{\sqrt{3}-2\sqrt{6}}{\sqrt{3}}$
2) $-\sqrt{3} + \dfrac{2}{3}\sqrt{6}$
3) $\dfrac{3-\sqrt{24}}{3}$
4) $\sqrt{3} - \dfrac{2}{3}\sqrt{6}$

333 What is the period of the graph of the equation $y = \dfrac{1}{3}\sin 2x$?
1) $\dfrac{1}{3}$
2) 2
3) π
4) 6π

334 The first four terms of the sequence defined by $a_1 = \dfrac{1}{2}$ and $a_{n+1} = 1 - a_n$ are
1) $\dfrac{1}{2}, \dfrac{1}{2}, \dfrac{1}{2}, \dfrac{1}{2}$
2) $\dfrac{1}{2}, 1, 1\dfrac{1}{2}, 2$
3) $\dfrac{1}{2}, \dfrac{1}{4}, \dfrac{1}{8}, \dfrac{1}{16}$
4) $\dfrac{1}{2}, 1\dfrac{1}{2}, 2\dfrac{1}{2}, 3\dfrac{1}{2}$

335 The scores on a standardized exam have a mean of 82 and a standard deviation of 3.6. Assuming a normal distribution, a student's score of 91 would rank
1) below the 75th percentile
2) between the 75th and 85th percentiles
3) between the 85th and 95th percentiles
4) above the 95th percentile

336 If $m = \{(-1,1),(1,1),(-2,4),(2,4),(-3,9),(3,9)\}$, which statement is true?
1) m and its inverse are both functions.
2) m is a function and its inverse is not a function.
3) m is not a function and its inverse is a function.
4) Neither m nor its inverse is a function.

337 If $\cos\theta = \frac{3}{4}$, then what is $\cos 2\theta$?

1) $\frac{1}{8}$

2) $\frac{9}{16}$

3) $-\frac{1}{8}$

4) $\frac{3}{2}$

338 The expression $\sqrt{-180x^{16}}$ is equivalent to

1) $-6x^4\sqrt{5}$

2) $-6x^8\sqrt{5}$

3) $6x^4 i\sqrt{5}$

4) $6x^8 i\sqrt{5}$

339 The ninth term of the expansion of $(3x + 2y)^{15}$ is

1) $_{15}C_9(3x)^6(2y)^9$

2) $_{15}C_9(3x)^9(2y)^6$

3) $_{15}C_8(3x)^7(2y)^8$

4) $_{15}C_8(3x)^8(2y)^7$

340 Six people met at a dinner party, and each person shook hands once with everyone there. Which expression represents the total number of handshakes?

1) $6!$

2) $6! \cdot 2!$

3) $\frac{6!}{2!}$

4) $\frac{6!}{4! \cdot 2!}$

341 Which value of k will make $x^2 - \frac{1}{4}x + k$ a perfect square trinomial?

1) $\frac{1}{64}$

2) $\frac{1}{16}$

3) $\frac{1}{8}$

4) $\frac{1}{4}$

342 If $f(x) = x^2 - x$ and $g(x) = x + 1$, determine $f(g(x))$ in simplest form.

343 The probability of winning a game is $\frac{2}{3}$.
Determine the probability, expressed as a fraction, of winning *exactly* four games if seven games are played.

344 In a circle, an arc length of 6.6 is intercepted by a central angle of $\frac{2}{3}$ radians. Determine the length of the radius.

345 In a triangle, two sides that measure 8 centimeters and 11 centimeters form an angle that measures 82°. To the *nearest tenth of a degree*, determine the measure of the *smallest* angle in the triangle.

346 Which graph does *not* represent a function?

1)

2)

3)

4)

347 Show that $\dfrac{\sec^2 x - 1}{\sec^2 x}$ is equivalent to $\sin^2 x$.

348 Solve algebraically for the exact values of x:
$$\frac{5x}{2} = \frac{1}{x} + \frac{x}{4}$$

349 Simplify: $\displaystyle\sum_{a=1}^{4}\left(x - a^2\right)$.

350 Solve the equation $2x^3 - x^2 - 8x + 4 = 0$ algebraically for all values of x.

351 Solve algebraically for x: $|3x - 5| - x < 17$

352 Solve algebraically, to the *nearest hundredth*, for all values of x:
$$\log_2(x^2 - 7x + 12) - \log_2(2x - 10) = 3$$

353 The table below shows the first-quarter averages for Mr. Harper's statistics class.

Statistics Class Averages

Quarter Averages	Frequency
99	1
97	5
95	4
92	4
90	7
87	2
84	6
81	2
75	1
70	2
65	1

What is the population variance for this set of data?
1) 8.2
2) 8.3
3) 67.3
4) 69.3

Algebra 2/Trigonometry Regents at Random
Answer Section

237 ANS: 2   PTS: 2   REF: 011501a2   STA: A2.A.73
     TOP: Law of Cosines   KEY: side, without calculator

238 ANS: 2   PTS: 2   REF: 011502a2   STA: A2.A.52
     TOP: Identifying the Equation of a Graph

239 ANS: 3   PTS: 2   REF: 011503a2   STA: A2.A.28
     TOP: Logarithmic Equations   KEY: basic

240 ANS: 1   PTS: 2   REF: 011506a2   STA: A2.A.53
     TOP: Graphing Exponential Functions

241 ANS: 2

$$(-5)^2 - 4(1)(4) = 9$$

     PTS: 2   REF: 011506a2   STA: A2.A.2   TOP: Using the Discriminant

242 ANS: 1

$$\frac{\frac{3}{4}}{-\frac{1}{2}} = -\frac{3}{2}$$

     PTS: 2   REF: 011508a2   STA: A2.A.31   TOP: Sequences

243 ANS: 3

$$\cos 2A = 1 - 2\sin^2 A = 1 - 2\left(\frac{3}{8}\right)^2 = \frac{32}{32} - \frac{9}{32} = \frac{23}{32}$$

     PTS: 2   REF: 011510a2   STA: A2.A.77   TOP: Double Angle Identities
     KEY: evaluating

244 ANS: 2

$$x^3 - 2x^2 - 9x + 18$$

$$x^2(x - 2) - 9(x - 2)$$

$$(x^2 - 9)(x - 2)$$

$$(x + 3)(x - 3)(x - 2)$$

     PTS: 2   REF: 011511a2   STA: A2.A.7   TOP: Factoring by Grouping

245 ANS: 4

$$(-3 - 2i)(-3 + 2i) = 9 - 4i^2 = 9 + 4 = 13$$

     PTS: 2   REF: 011512a2   STA: A2.N.9
     TOP: Multiplication and Division of Complex Numbers

246 ANS: 4   PTS: 2   REF: 011513a2   STA: A2.A.49
     TOP: Equations of Circles

247 ANS: 3

$$\frac{c}{a} = \frac{-3}{4}$$

PTS: 2　　　　REF: 011517a2　　STA: A2.A.20　　TOP: Roots of Quadratics
248 ANS: 4　　　　PTS: 2　　　　REF: 011504a2　　STA: A2.A.34
TOP: Sigma Notation
249 ANS: 2

$$5^2 a^{-3} b^4 = \frac{25 b^4}{a^3}$$

PTS: 2　　　　REF: 011514a2　　STA: A2.A.9　　　TOP: Negative Exponents
250 ANS: 3

$$\sin^2 x \left(1 + \frac{\cos^2 x}{\sin^2 x}\right) = \sin^2 x + \cos^2 x = 1 \quad \frac{1}{\cos^2 x}(\cos^2 x) = 1 \quad \cos^2 x \left(\frac{\sin^2 x}{\cos^2 x} - 1\right) = \sin^2 x - \cos^2 x \neq 1$$

$$\frac{\cos^2 x}{\sin^2 x}\left(\frac{1}{\cos^2 x} - 1\right) = \frac{1}{\sin^2 x} - \frac{\cos^2 x}{\sin^2 x} = \csc^2 x - \cot x = 1$$

PTS: 2　　　　REF: 011515a2　　STA: A2.A.58　　TOP: Reciprocal Trigonometric Relationships
251 ANS: 1

$$\sqrt[3]{64 a^5 b^6} = \sqrt[3]{4^3 a^3 a^2 b^6} = 4 a b^2 \sqrt[3]{a^2}$$

PTS: 2　　　　REF: 011516a2　　STA: A2.N.2　　　TOP: Operations with Radicals
252 ANS: 1

$$\frac{{}_{11}P_{11}}{2!2!2!2!} = \frac{39,916,800}{16} = 2,494,800$$

PTS: 2　　　　REF: 011518a2　　STA: A2.S.10　　TOP: Permutations
253 ANS: 1

$$_5 C_2 (2x)^{5-2}(-3)^2 = 720 x^3$$

PTS: 2　　　　REF: 011519a2　　STA: A2.A.36　　TOP: Binomial Expansions
254 ANS: 2

$$\sec \theta = \frac{\sqrt{x^2 + y^2}}{x} = \frac{\sqrt{(-4)^2 + 0^2}}{-4} = \frac{4}{-4} = -1$$

PTS: 2　　　　REF: 011520a2　　STA: A2.A.62　　TOP: Determining Trigonometric Functions
255 ANS: 2　　　　PTS: 2　　　　REF: 011521a2　　STA: A2.A.39
TOP: Domain and Range　　　　　　KEY: real domain

256 ANS: 3

$$\frac{5x}{x(x-3)} - \frac{2(x-3)}{x(x-3)} = \frac{x(x-3)}{x(x-3)}$$

$$5x - 2x + 6 = x^2 - 3x$$

$$0 = x^2 - 6x - 6$$

PTS: 2   REF: 011522a2   STA: A2.A.23   TOP: Solving Rationals
KEY: irrational and complex solutions

257 ANS: 4

$$\frac{\sqrt{34}}{\sin 30} = \frac{12}{\sin B}$$

$$B = \sin^{-1} \frac{12 \sin 30}{\sqrt{34}}$$

$$\approx \sin^{-1} \frac{6}{5.8}$$

PTS: 2   REF: 011523a2   STA: A2.A.75   TOP: Law of Sines - The Ambiguous Case

258 ANS: 4

$$\left(\frac{3}{2}x - 1\right)\left[\left(\frac{3}{2}x + 1\right) - \left(\frac{3}{2}x - 1\right)\right] = \left(\frac{3}{2}x - 1\right)(2) = 3x - 2$$

PTS: 2   REF: 011524a2   STA: A2.N.3   TOP: Operations with Polynomials

259 ANS: 2
$$12 - 7 = 5$$

PTS: 2   REF: 011525a2   STA: A2.S.4   TOP: Dispersion
KEY: range, quartiles, interquartile range, variance

260 ANS: 2

$$s = \theta\, r = \frac{2\pi}{5} \cdot 18 \approx 23$$

PTS: 2   REF: 011526a2   STA: A2.A.61   TOP: Arc Length
KEY: arc length

261 ANS: 4

$$f(a + 1) = 4(a + 1)^2 - (a + 1) + 1$$

$$= 4(a^2 + 2a + 1) - a$$

$$= 4a^2 + 8a + 4 - a$$

$$= 4a^2 + 7a + 4$$

PTS: 2   REF: 011527a2   STA: A2.A.41   TOP: Functional Notation

262 ANS:

$$25 \cdot 6 = 30q$$

$$5 = q$$

PTS: 2   REF: 011528a2   STA: A2.A.5   TOP: Inverse Variation

263 ANS:

$$\frac{(6-x)(6+x)}{(x+6)(x+6)} \cdot \frac{(x+6)(x-3)}{x-3} = 6 - x$$

PTS: 2   REF: 011529a2   STA: A2.A.16   TOP: Multiplication and Division of Rationals
KEY: division

264 ANS:

$$\ln e^{4x} = \ln 12$$

$$4x = \ln 12$$

$$x = \frac{\ln 12}{4}$$

$$\approx 0.62$$

PTS: 2   REF: 011530a2   STA: A2.A.27   TOP: Exponential Equations
KEY: without common base

265 ANS:

$$\frac{5}{11} \pi \left(\frac{180}{\pi} \right) = 81°49'$$

PTS: 2   REF: 011531a2   STA: A2.M.2   TOP: Radian Measure
KEY: degrees

266 ANS:

$$_6C_5 \left(\frac{2}{5} \right)^5 \left(\frac{3}{5} \right) = 6 \left(\frac{32}{3125} \right) \left(\frac{3}{5} \right) = \frac{576}{15,625}$$

PTS: 2   REF: 011532a2   STA: A2.S.15   TOP: Binomial Probability
KEY: exactly

267 ANS:

$$2xi(i - 4i^2) = 2xi^2 - 8xi^3 = 2xi^2 - 8xi^3 = -2x + 8xi$$

PTS: 2   REF: 011533a2   STA: A2.N.9
TOP: Multiplication and Division of Complex Numbers

268 ANS:

$$sd = \frac{81 - 57}{3} = 8$$

$$57 + 8 = 65$$

$$81 - 2(8) = 65$$

PTS: 2   REF: 011534a2   STA: A2.S.5   TOP: Normal Distributions
KEY: mean and standard deviation

269 ANS:

$$594 = 32 \cdot 46 \sin C$$

$$\frac{594}{1472} = \sin C$$

$$23.8 \approx C$$

PTS: 2   REF: 011535a2   STA: A2.A.74   TOP: Using Trigonometry to Find Area
KEY: Parallelograms

270 ANS:

$$y = 733.646(0.786)^x \quad 733.646(0.786)^{12} \approx 41$$

PTS: 4   REF: 011536a2   STA: A2.S.7   TOP: Exponential Regression

271 ANS:

$$a = 3, b = 2, c = 1 \quad y = 3\cos 2x + 1.$$

PTS: 2   REF: 011538a2   STA: A2.A.72
TOP: Identifying the Equation of a Trigonometric Graph

272 ANS:

$$a_2 = 3(2)^{-2} = \frac{3}{4} \quad a_3 = 3\left(\frac{3}{4}\right)^{-2} = \frac{16}{3} \quad a_4 = 3\left(\frac{16}{3}\right)^{-2} = \frac{27}{256}$$

PTS: 4   REF: 011537a2   STA: A2.A.33   TOP: Recursive Sequences

273 ANS:

$$(x + 14)(x + 22) = 800 \quad x = \frac{-36 \pm \sqrt{(-36)^2 - 4(1)(-492)}}{2(1)} = \frac{-36 + \sqrt{3264}}{2} \approx 10.6 \quad 10 \text{ feet increase.}$$

$$x^2 + 36x + 308 = 800$$

$$x^2 + 36x - 492 = 0$$

PTS: 6   REF: 011539a2   STA: A2.A.25   TOP: Quadratics with Irrational Solutions

274 ANS: 3   PTS: 2   REF: 061501a2   STA: A2.A.43
TOP: Defining Functions

275 ANS: 4   PTS: 2   REF: 061506a2   STA: A2.A.9
TOP: Negative Exponents

276 ANS: 2   PTS: 2   REF: 061502a2   STA: A2.M.1
TOP: Radian Measure

277 ANS: 4

$g(-2) = 3(-2) - 2 = -8 \quad f(-8) = 2(-8)^2 + 1 = 128 + 1 = 129$

PTS: 2 REF: 061503a2 STA: A2.A.42 TOP: Compositions of Functions
KEY: numbers

278 ANS: 1

$\sqrt[3]{27a^3} \cdot \sqrt[4]{16b^8} = 3a \cdot 2b^2 = 6ab^2$

PTS: 2 REF: 061504a2 STA: A2.A.14 TOP: Operations with Radicals
KEY: with variables | index > 2

279 ANS: 3

$$x^2 = 12x - 7$$
$$x^2 - 12x = -7$$
$$x^2 - 12x + 36 = -7 + 36$$
$$(x-6)^2 = 29$$

PTS: 2 REF: 061505a2 STA: A2.A.24 TOP: Completing the Square

280 ANS:

Sum $\dfrac{-b}{a} = \dfrac{-2}{3}$. Product $\dfrac{c}{a} = \dfrac{k}{3}$

PTS: 2 REF: 061534a2 STA: A2.A.20 TOP: Roots of Quadratics

281 ANS: 2

$$9 - x^2 < 0 \qquad \text{or } x + 3 < 0 \text{ and } x - 3 < 0$$
$$x^2 - 9 > 0 \qquad\qquad x < -3 \text{ and } x < 3$$
$$(x+3)(x-3) > 0 \qquad\qquad x < -3$$
$$x + 3 > 0 \text{ and } x - 3 > 0$$
$$x > -3 \text{ and } x > 3$$
$$x > 3$$

PTS: 2 REF: 061507a2 STA: A2.A.4 TOP: Quadratic Inequalities
KEY: one variable

282 ANS: 2

$$K = 8 \cdot 12 \sin 120 = 96 \cdot \frac{\sqrt{3}}{2} = 48\sqrt{3}$$

PTS: 2 REF: 061508a2 STA: A2.A.74 TOP: Using Trigonometry to Find Area
KEY: parallelograms

283 ANS: 1

$$\frac{5}{4-\sqrt{11}} \cdot \frac{4+\sqrt{11}}{4+\sqrt{11}} = \frac{5(4+\sqrt{11})}{16-11} = \frac{5(4+\sqrt{11})}{5} = 4+\sqrt{11}$$

PTS: 2   REF: 061509a2   STA: A2.N.5   TOP: Rationalizing Denominators

284 ANS: 2   PTS: 2   REF: 061510a2   STA: A2.A.5
TOP: Inverse Variation

285 ANS: 1

$$\frac{{}_9P_9}{4! \cdot 2! \cdot 2!} = \frac{362,880}{96} = 3,780$$

PTS: 2   REF: 061511a2   STA: A2.S.10   TOP: Permutations

286 ANS: 3

$$a_4 = 3xy^5\left(\frac{2x}{y}\right)^3 = 3xy^5\left(\frac{8x^3}{y^3}\right) = 24x^4y^2$$

PTS: 2   REF: 061512a2   STA: A2.A.33   TOP: Sequences

287 ANS: 2

$x - 2 = 3x + 10$ -6 is extraneous. $x - 2 = -3x - 10$

$-12 = 2x$ $4x = -8$

$-6 = x$ $x = -2$

PTS: 2   REF: 061513a2   STA: A2.A.1   TOP: Absolute Value Equations

288 ANS: 3   PTS: 2   REF: 061515a2   STA: A2.N.3
TOP: Operations with Polynomials

289 ANS: 3   PTS: 2   REF: 061514a2   STA: A2.A.55
TOP: Trigonometric Ratios

290 ANS: 1   PTS: 2   REF: 061516a2   STA: A2.A.46
TOP: Transformations with Functions and Relations

291 ANS: 1

$\log x = \log a^2 + \log b$

$\log x = \log a^2 b$

$x = a^2 b$

PTS: 2   REF: 061517a2   STA: A2.A.19   TOP: Properties of Logarithms
KEY: antilogarithms

292 ANS: 4   PTS: 2   REF: 061520a2   STA: A2.A.29
TOP: Sequences

293 ANS: 4   PTS: 2   REF: 061518a2   STA: A2.A.51
TOP: Domain and Range

294 ANS: 1

$$\frac{2\pi}{2} = \pi$$

$$\frac{\pi}{\pi} = 1$$

PTS: 2   REF: 061519a2   STA: A2.A.69
TOP: Properties of Graphs of Trigonometric Functions   KEY: period

295 ANS: 3   PTS: 2   REF: 061523a2   STA: A2.S.9
TOP: Differentiating Permutations and Combinations

296 ANS: 2   PTS: 2   REF: 061521a2   STA: A2.A.44
TOP: Inverse of Functions   KEY: equations

297 ANS: 1

$$\frac{1 + \cos 2A}{\sin 2A} = \frac{1 + 2\cos^2 A - 1}{2\sin A \cos A} = \frac{\cos A}{\sin A} = \cot A$$

PTS: 2   REF: 061522a2   STA: A2.A.77   TOP: Double Angle Identities
KEY: simplifying

298 ANS: 3

$$3x^2 + x - 14 = 0 \quad 1^2 - 4(3)(-14) = 1 + 168 = 169 = 13^2$$

PTS: 2   REF: 061524a2   STA: A2.A.2   TOP: Using the Discriminant
KEY: determine nature of roots given equation

299 ANS: 2

$$x = 2 \cdot \frac{\sqrt{3}}{2} = \sqrt{3} \quad y = 2 \cdot \frac{1}{2} = 1$$

PTS: 2   REF: 061525a2   STA: A2.A.62   TOP: Determining Trigonometric Functions

300 ANS: 4

$$(3 - 2a)^0 + (3 - 2a)^1 + (3 - 2a)^2 = 1 + 3 - 2a + 9 - 12a + 4a^2 = 4a^2 - 14a + 13$$

PTS: 2   REF: 061526a2   STA: A2.N.10   TOP: Sigma Notation
KEY: advanced

301 ANS: 3

$$p(5) - p(0) = 17(1.15)^{2(5)} - 17(1.15)^{2(0)} \approx 68.8 - 17 \approx 51$$

PTS: 2   REF: 061527a2   STA: A2.A.12   TOP: Evaluating Exponential Expressions

302 ANS:

$$5^{4x} = \left(5^3\right)^{x-1}$$

$$4x = 3x - 3$$

$$x = -3$$

PTS: 2   REF: 061528a2   STA: A2.A.27   TOP: Exponential Equations
KEY: common base shown

303 ANS:

$$\frac{8}{\sin 85} = \frac{2}{\sin C} \qquad 85 + 14.4 < 180 \quad 1 \text{ triangle}$$

$$C = \sin^{-1}\left(\frac{2\sin 85}{8}\right) \qquad 85 + 165.6 \geq 180$$

$$C \approx 14.4$$

PTS: 2   REF: 061529a2   STA: A2.A.75   TOP: Law of Sines - The Ambiguous Case

304 ANS:

$$_3C_1\left(\frac{1}{4}\right)^1\left(\frac{3}{4}\right)^2 = 3 \cdot \frac{1}{4} \cdot \frac{9}{16} = \frac{27}{64}$$

PTS: 2   REF: 061530a2   STA: A2.S.15   TOP: Binomial Probability
KEY: exactly

305 ANS:

$$(x+1)^3 = 64$$

$$x + 1 = 4$$

$$x = 3$$

PTS: 2   REF: 061531a2   STA: A2.A.28   TOP: Logarithmic Equations
KEY: basic

306 ANS:

5.17 84.46 ± 5.17

$79.29 - 89.63$

$5 + 7 + 5 = 17$

PTS: 4   REF: 061538a2   STA: A2.S.4   TOP: Dispersion
KEY: advanced, group frequency distributions

307 ANS:

$$x^2(x-6) - 25(x-6)$$

$$(x^2 - 25)(x-6)$$

$$(x+5)(x-5)(x-6)$$

PTS: 2   REF: 061532a2   STA: A2.A.7   TOP: Factoring by Grouping

308 ANS:

$$xi^8 - yi^6 = x(1) - y(-1) = x + y$$

PTS: 2   REF: 061533a2   STA: A2.N.7   TOP: Imaginary Numbers

309 ANS:

$r_A \approx 0.976$ $r_B \approx 0.994$ Set B has the stronger linear relationship since r is higher.

PTS: 2   REF: 061535a2   STA: A2.S.8   TOP: Correlation Coefficient

310 ANS:

$$28^2 = 47^2 + 34^2 - 2(47)(34)\cos A$$

$$784 = 3365 - 3196\cos A$$

$$-2581 = -3196\cos A$$

$$\frac{2581}{3196} = \cos A$$

$$36 \approx A$$

PTS: 4   REF: 061536a2   STA: A2.A.73   TOP: Law of Cosines
KEY: find angle

311 ANS:

$$\frac{3}{x} + \frac{x}{x+2} = -\frac{2}{x+2}$$

$$\frac{x+2}{x+2} = -\frac{3}{x}$$

$$1 = -\frac{3}{x}$$

$$x = -3$$

PTS: 4   REF: 061537a2   STA: A2.A.23   TOP: Solving Rationals
KEY: rational solutions

312 ANS:

$$5\cos\theta - 2\sec\theta + 3 = 0$$

$$5\cos\theta - \frac{2}{\cos\theta} + 3 = 0$$

$$5\cos^2\theta + 3\cos\theta - 2 = 0$$

$$(5\cos\theta - 2)(\cos\theta + 1) = 0$$

$$\cos\theta = \frac{2}{5}, -1$$

$$\theta \approx 66.4, 293.6, 180$$

PTS: 6   REF: 061539a2   STA: A2.A.68   TOP: Trigonometric Equations
KEY: reciprocal functions

313 ANS: 1   PTS: 2   REF: 081501a2   STA: A2.A.50
TOP: Solving Polynomial Equations

314 ANS:

$$2.5\left(\frac{180}{\pi}\right) = 143°14'$$

PTS: 2   REF: 081528a2   STA: A2.M.2   TOP: Radian Measure
KEY: degrees

315 ANS: 2 PTS: 2 REF: 081502a2 STA: A2.S.8
TOP: Correlation Coefficient

316 ANS: 4

$$f(16) = 4(16)^{\frac{1}{2}} + 16^0 + 16^{-\frac{1}{4}}$$

$$= 4(4) + 1 + \frac{1}{2}$$

$$= 17\frac{1}{2}$$

PTS: 2 REF: 081503a2 STA: A2.N.1 TOP: Negative and Fractional Exponents

317 ANS: 1

$$\sqrt[4]{81x^2y^5} = 81^{\frac{1}{4}}x^{\frac{2}{4}}y^{\frac{5}{4}} = 3x^{\frac{1}{2}}y^{\frac{5}{4}}$$

PTS: 2 REF: 081504a2 STA: A2.A.11 TOP: Radicals as Fractional Exponents

318 ANS: 1

$$\sin 120 = \frac{\sqrt{3}}{2} \quad \csc 120 = \frac{2}{\sqrt{3}} \cdot \frac{\sqrt{3}}{\sqrt{3}} = \frac{2\sqrt{3}}{3}$$

PTS: 2 REF: 081505a2 STA: A2.A.59 TOP: Reciprocal Trigonometric Relationships

319 ANS: 2

$$P = \frac{c}{a} = \frac{-12}{3} = -4$$

PTS: 2 REF: 081506a2 STA: A2.A.20 TOP: Roots of Quadratics

320 ANS: 4

$$3 \cdot 400 = 8x$$

$$150 = x$$

PTS: 2 REF: 081507a2 STA: A2.A.5 TOP: Inverse Variation

321 ANS: 1

If $\sin\theta = \frac{15}{17}$, then $\cos\theta = \frac{8}{17}$. $\tan\theta = \dfrac{\frac{8}{17}}{\frac{15}{17}} = \frac{8}{15}$

PTS: 2 REF: 081508a2 STA: A2.A.64 TOP: Using Inverse Trigonometric Functions
KEY: advanced

322 ANS: 2 PTS: 2 REF: 081509a2 STA: A2.S.4
TOP: Dispersion KEY: basic, group frequency distributions

323 ANS: 2

$$A = 50 \left(1 + \frac{.0325}{4}\right)^{4 \cdot 12} = 50(1.008125)^{48} \approx 73.73$$

PTS: 2 REF: 081511a2 STA: A2.A.12 TOP: Evaluating Exponential Expressions

324 ANS:

$$2^{-4} = 2^{3x-1}$$

$$-4 = 3x - 1$$

$$-3 = 3x$$

$$-1 = x$$

PTS: 2 REF: 081529a2 STA: A2.A.27 TOP: Exponential Equations
KEY: common base shown

325 ANS: 3

$$\frac{40 - 10}{6 - 1} = \frac{30}{5} = 6 \quad a_n = 6n + 4$$

$$a_{20} = 6(20) + 4 = 124$$

PTS: 2 REF: 081510a2 STA: A2.A.32 TOP: Sequences

326 ANS: 1

$$\frac{_{11}P_{11}}{3!2!2!2!} = \frac{39,916,800}{48} = 831,600$$

PTS: 2 REF: 081512a2 STA: A2.S.10 TOP: Permutations

327 ANS: 3

$$_9C_3 = 84$$

PTS: 2 REF: 081513a2 STA: A2.S.11 TOP: Combinations

328 ANS: 2

$$(2\sin x - 1)(\sin x + 1) = 0$$

$$\sin x = \frac{1}{2}, -1$$

$$x = 30, 150, 270$$

PTS: 2 REF: 081514a2 STA: A2.A.68 TOP: Trigonometric Equations
KEY: quadratics

329 ANS: 2 PTS: 2 REF: 081515a2 STA: A2.A.57
TOP: Reference Angles

330 ANS: 3

$$r = \sqrt{(6-2)^2 + (2--3)^2} = \sqrt{16 + 25} = \sqrt{41}$$

PTS: 2 REF: 081516a2 STA: A2.A.48 TOP: Equations of Circles

331 ANS: 3   PTS: 2   REF: 081517a2   STA: A2.A.39
     TOP: Domain and Range   KEY: real domain

332 ANS: 4

$$\frac{3 - \sqrt{8}}{\sqrt{3}} \cdot \frac{\sqrt{3}}{\sqrt{3}} = \frac{3\sqrt{3} - \sqrt{24}}{3} = \frac{3\sqrt{3} - 2\sqrt{6}}{3} = \sqrt{3} - \frac{2}{3}\sqrt{6}$$

     PTS: 2   REF: 081518a2   STA: A2.N.5   TOP: Rationalizing Denominators

333 ANS: 3

$$\frac{2\pi}{2} = \pi$$

     PTS: 2   REF: 081519a2   STA: A2.A.69
     TOP: Properties of Graphs of Trigonometric Functions   KEY: period

334 ANS: 1   PTS: 2   REF: 081520a2   STA: A2.A.33
     TOP: Sequences

335 ANS: 4

$$\frac{91 - 82}{3.6} = 2.5\,\text{sd}$$

     PTS: 2   REF: 081521a2   STA: A2.S.5   TOP: Normal Distributions
     KEY: interval

336 ANS: 2   PTS: 2   REF: 081523a2   STA: A2.A.44
     TOP: Inverse of Functions   KEY: ordered pairs

337 ANS: 1

$$\cos 2\theta = 2\left(\frac{3}{4}\right)^2 - 1 = 2\left(\frac{9}{16}\right) - 1 = \frac{9}{8} - \frac{8}{8} = \frac{1}{8}$$

     PTS: 2   REF: 081522a2   STA: A2.A.77   TOP: Double Angle Identities
     KEY: evaluating

338 ANS: 4

$$\sqrt{-180x^{16}} = 6x^8 i\sqrt{5}$$

     PTS: 2   REF: 081524a2   STA: A2.N.6   TOP: Square Roots of Negative Numbers

339 ANS: 3   PTS: 2   REF: 081525a2   STA: A2.A.36
     TOP: Binomial Expansions

340 ANS: 4   PTS: 2   REF: 081526a2   STA: A2.S.9
     TOP: Differentiating Permutations and Combinations

341 ANS: 1

$$\left(\frac{1}{2}\left(-\frac{1}{4}\right)\right)^2 = \frac{1}{64}$$

     PTS: 2   REF: 081527a2   STA: A2.A.24   TOP: Completing the Square

342 ANS:

$(x+1)^2 - (x+1) = x^2 + 2x + 1 - x - 1 = x^2 + x$

PTS: 2   REF: 081530a2   STA: A2.A.42   TOP: Compositions of Functions
KEY: variables

343 ANS:

$_7C_4\left(\dfrac{2}{3}\right)^4\left(\dfrac{1}{3}\right)^3 = 35\left(\dfrac{16}{81}\right)\left(\dfrac{1}{27}\right) = \dfrac{560}{2187}$

PTS: 2   REF: 081531a2   STA: A2.S.15   TOP: Binomial Probability
KEY: exactly

344 ANS:

$r = \dfrac{6.6}{\frac{2}{3}} = 9.9$

PTS: 2   REF: 081532a2   STA: A2.A.61   TOP: Arc Length
KEY: radius

345 ANS:

$a = \sqrt{8^2 + 11^2 - 2(8)(11)\cos 82} \approx 12.67.$ The angle opposite the shortest side: $\dfrac{8}{\sin x} = \dfrac{12.67}{\sin 82}$

$$x \approx 38.7$$

PTS: 4   REF: 081536a2   STA: A2.A.73   TOP: Law of Cosines
KEY: advanced

346 ANS: 4   PTS: 2   REF: fall0908a2   STA: A2.A.38
TOP: Defining Functions   KEY: graphs

347 ANS:

$\dfrac{\frac{1}{\cos^2 x} - 1}{\frac{1}{\cos^2 x}} \cdot \dfrac{\cos^2 x}{\cos^2 x} = \dfrac{1 - \cos^2 x}{1} = \sin^2 x$

PTS: 2   REF: 081533a2   STA: A2.A.58   TOP: Reciprocal Trigonometric Relationships

348 ANS:

$$\frac{10x}{4} = \frac{1}{x} + \frac{x}{4}$$

$$\frac{9x}{4} = \frac{1}{x}$$

$$9x^2 = 4$$

$$x^2 = \frac{4}{9}$$

$$x = \pm\frac{2}{3}$$

PTS: 2   REF: 081534a2   STA: A2.A.23   TOP: Solving Rationals
KEY: rational solutions

349 ANS:
$x - 1 + x - 4 + x - 9 + x - 16 = 4x - 30$

PTS: 2   REF: 081535a2   STA: A2.N.10   TOP: Sigma Notation
KEY: advanced

350 ANS:
$x^2(2x - 1) - 4(2x - 1) = 0$

$(x^2 - 4)(2x - 1) = 0$

$(x + 2)(x - 2)(2x - 1) = 0$

$$x = \pm 2, \; \frac{1}{2}$$

PTS: 4   REF: 081537a2   STA: A2.A.26   TOP: Solving Polynomial Equations

351 ANS:
$|3x - 5| < x + 17$ $3x - 5 < x + 17$ and $3x - 5 > -x - 17$ $-3 < x < 11$

$2x < 22$ $4x > -12$

$x < 11$ $x > -3$

PTS: 4   REF: 081538a2   STA: A2.A.1   TOP: Absolute Value Inequalities

352 ANS:

$$\log_2\left(\frac{x^2 - 7x + 12}{2x - 10}\right) = 3 \qquad x = \frac{23 \pm \sqrt{(-23)^2 - 4(1)(92)}}{2(1)} \approx 17.84, 5.16$$

$$\frac{x^2 - 7x + 12}{2x - 10} = 8$$

$$x^2 - 7x + 12 = 16x - 80$$

$$x^2 - 23x + 92 = 0$$

PTS: 6   REF: 081539a2   STA: A2.A.28   TOP: Logarithmic Equations
KEY: applying properties of logarithms

353 ANS: 3

PTS: 2   REF: fall0924a2   STA: A2.S.4   TOP: Dispersion
KEY: range, quartiles, interquartile range, variance

Algebra 2/Trigonometry Regents at Random

354 The expression $\sqrt[4]{16x^2y^7}$ is equivalent to

1) $2x^{\frac{1}{2}}y^{\frac{7}{4}}$
2) $2x^8y^{28}$
3) $4x^{\frac{1}{2}}y^{\frac{7}{4}}$
4) $4x^8y^{28}$

355 Solve algebraically for x: $16^{2x+3} = 64^{x+2}$

356 What is the number of degrees in an angle whose radian measure is $\frac{11\pi}{12}$?

1) 150
2) 165
3) 330
4) 518

357 The probability that a professional baseball player will get a hit is $\frac{1}{3}$. Calculate the exact probability that he will get *at least* 3 hits in 5 attempts.

358 Which relation is *not* a function?

1) $(x-2)^2 + y^2 = 4$
2) $x^2 + 4x + y = 4$
3) $x + y = 4$
4) $xy = 4$

359 Express $\dfrac{5}{3-\sqrt{2}}$ with a rational denominator, in simplest radical form.

360 Which function is *not* one-to-one?

1) $\{(0,1),(1,2),(2,3),(3,4)\}$
2) $\{(0,0),(1,1),(2,2),(3,3)\}$
3) $\{(0,1),(1,0),(2,3),(3,2)\}$
4) $\{(0,1),(1,0),(2,0),(3,2)\}$

361 A circle shown in the diagram below has a center of $(-5,3)$ and passes through point $(-1,7)$.
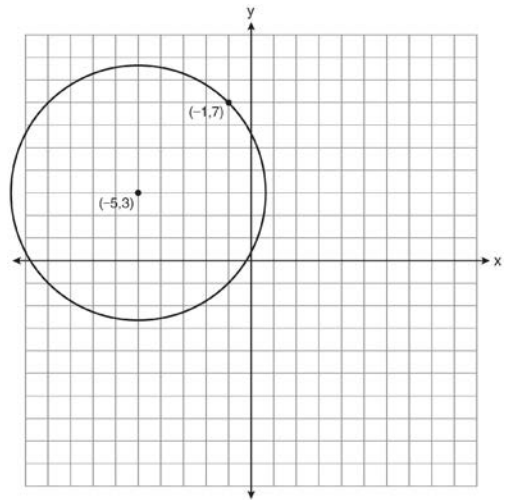
Write an equation that represents the circle.

362 Factor completely: $10ax^2 - 23ax - 5a$

363 The equation $y - 2\sin\theta = 3$ may be rewritten as
1) $f(y) = 2\sin x + 3$
2) $f(y) = 2\sin\theta + 3$
3) $f(x) = 2\sin\theta + 3$
4) $f(\theta) = 2\sin\theta + 3$

364 Assume that the ages of first-year college students are normally distributed with a mean of 19 years and standard deviation of 1 year. To the *nearest integer*, find the percentage of first-year college students who are between the ages of 18 years and 20 years, inclusive. To the *nearest integer*, find the percentage of first-year college students who are 20 years old or older.

365 Two sides of a parallelogram are 24 feet and 30 feet. The measure of the angle between these sides is 57°. Find the area of the parallelogram, to the *nearest square foot*.

366 What is the domain of the function
$f(x) = \sqrt{x - 2} + 3$?
1) $(-\infty, \infty)$
2) $(2, \infty)$
3) $[2, \infty)$
4) $[3, \infty)$

367 The equation $x^2 + y^2 - 2x + 6y + 3 = 0$ is equivalent to
1) $(x - 1)^2 + (y + 3)^2 = -3$
2) $(x - 1)^2 + (y + 3)^2 = 7$
3) $(x + 1)^2 + (y + 3)^2 = 7$
4) $(x + 1)^2 + (y + 3)^2 = 10$

368 Which graph represents the equation $y = \cos^{-1} x$?
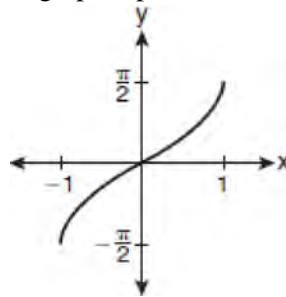
1)
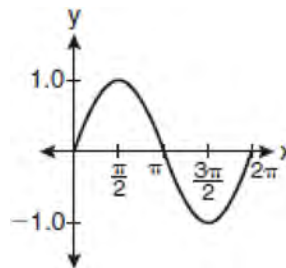
2)
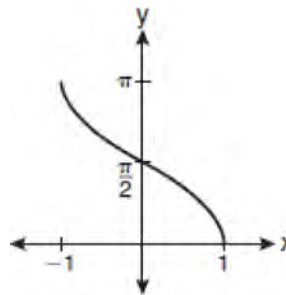
3)
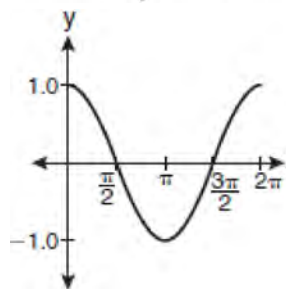
4)

369 An auditorium has 21 rows of seats. The first row has 18 seats, and each succeeding row has two more seats than the previous row. How many seats are in the auditorium?
1) 540
2) 567
3) 760
4) 798

370 Which values of x are in the solution set of the following system of equations?

$$y = 3x - 6$$

$$y = x^2 - x - 6$$

1) $0, -4$
2) $0, 4$
3) $6, -2$
4) $-6, 2$

371 The probability that the Stormville Sluggers will win a baseball game is $\frac{2}{3}$. Determine the probability, to the *nearest thousandth*, that the Stormville Sluggers will win *at least* 6 of their next 8 games.

372 The expression $\dfrac{4}{5 - \sqrt{13}}$ is equivalent to

1) $\dfrac{4\sqrt{13}}{5\sqrt{13} - 13}$

2) $\dfrac{4(5 - \sqrt{13})}{38}$

3) $\dfrac{5 + \sqrt{13}}{3}$

4) $\dfrac{4(5 + \sqrt{13})}{38}$

373 The graph below shows the function f(x).
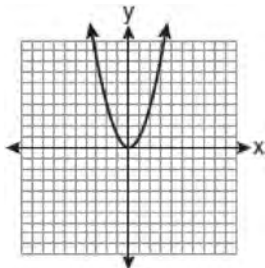
Which graph represents the function f($x + 2$)?
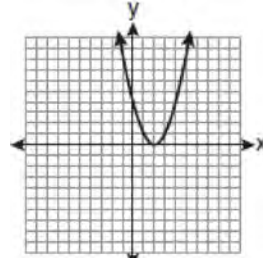
1)
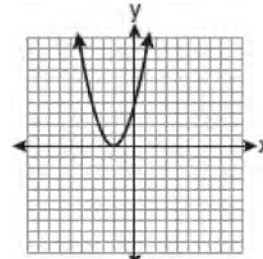
2)
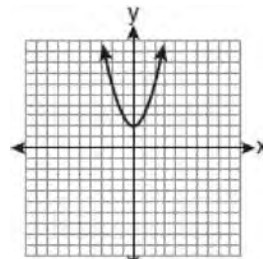
3)
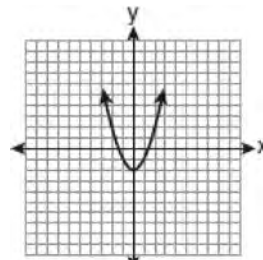
4)

374 The product of i^7 and i^5 is equivalent to
1) 1
2) -1
3) i
4) $-i$

50

375 A dartboard is shown in the diagram below. The two lines intersect at the center of the circle, and the central angle in sector 2 measures $\frac{2\pi}{3}$.
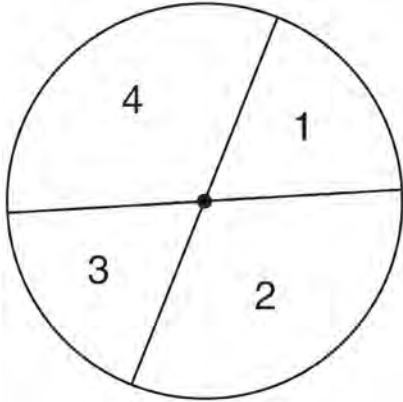
If darts thrown at this board are equally likely to land anywhere on the board, what is the probability that a dart that hits the board will land in either sector 1 or sector 3?

1) $\frac{1}{6}$

2) $\frac{1}{3}$

3) $\frac{1}{2}$

4) $\frac{2}{3}$

376 The expression $\frac{a^2 b^{-3}}{a^{-4} b^2}$ is equivalent to

1) $\frac{a^6}{b^5}$

2) $\frac{b^5}{a^6}$

3) $\frac{a^2}{b}$

4) $a^{-2} b^{-1}$

377 What is the radian measure of an angle whose measure is −420°?

1) $-\frac{7\pi}{3}$

2) $-\frac{7\pi}{6}$

3) $\frac{7\pi}{6}$

4) $\frac{7\pi}{3}$

378 The graph below represents the function $y = f(x)$.
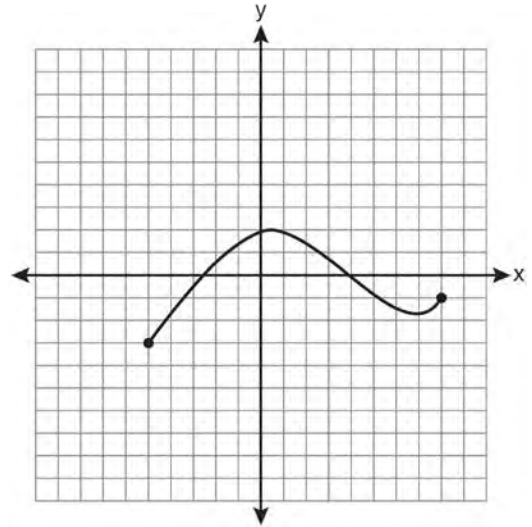
State the domain and range of this function.

379 What is the principal value of $\cos^{-1}\left(-\frac{\sqrt{3}}{2}\right)$?

1) −30°
2) 60°
3) 150°
4) 240°

51

380 Which ratio represents $\csc A$ in the diagram below?
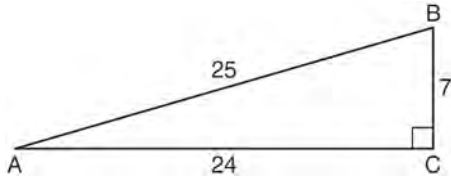
1) $\dfrac{25}{24}$

2) $\dfrac{25}{7}$

3) $\dfrac{24}{7}$

4) $\dfrac{7}{24}$

381 The expression $4ab\sqrt{2b} - 3a\sqrt{18b^3} + 7ab\sqrt{6b}$ is equivalent to

1) $2ab\sqrt{6b}$

2) $16ab\sqrt{2b}$

3) $-5ab + 7ab\sqrt{6b}$

4) $-5ab\sqrt{2b} + 7ab\sqrt{6b}$

382 Which values of x are solutions of the equation $x^3 + x^2 - 2x = 0$?

1) $0, 1, 2$

2) $0, 1, -2$

3) $0, -1, 2$

4) $0, -1, -2$

383 Solve for x: $\dfrac{4x}{x-3} = 2 + \dfrac{12}{x-3}$

384 What are the domain and the range of the function shown in the graph below?
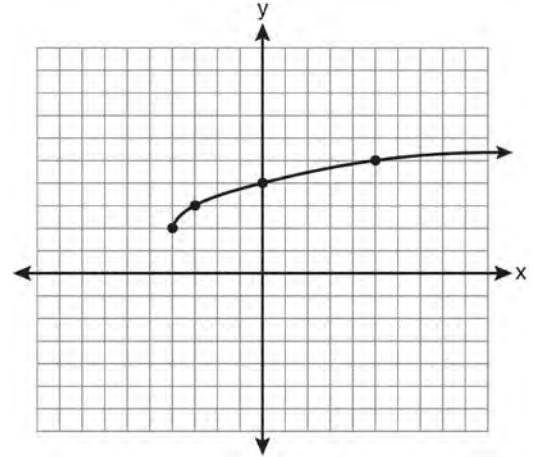
1) $\{x \mid x > -4\}; \{y \mid y > 2\}$

2) $\{x \mid x \geq -4\}; \{y \mid y \geq 2\}$

3) $\{x \mid x > 2\}; \{y \mid y > -4\}$

4) $\{x \mid x \geq 2\}; \{y \mid y \geq -4\}$

385 Solve $2x^2 - 12x + 4 = 0$ by completing the square, expressing the result in simplest radical form.
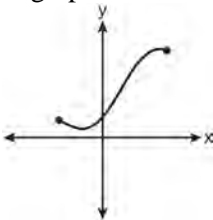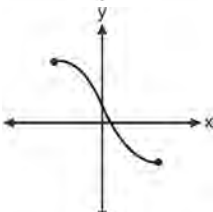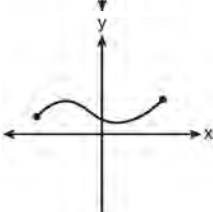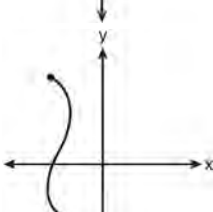
386 If $\sin^{-1}\left(\dfrac{5}{8}\right) = A$, then

1) $\sin A = \dfrac{5}{8}$

2) $\sin A = \dfrac{8}{5}$

3) $\cos A = \dfrac{5}{8}$

4) $\cos A = \dfrac{8}{5}$

387 What is the common difference of the arithmetic sequence $5, 8, 11, 14$?
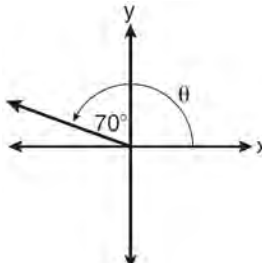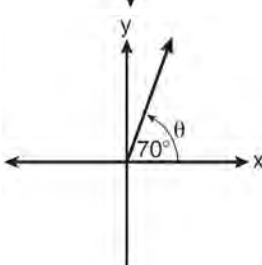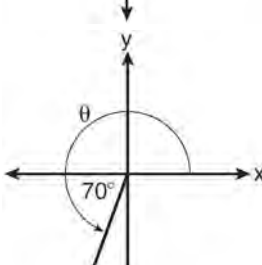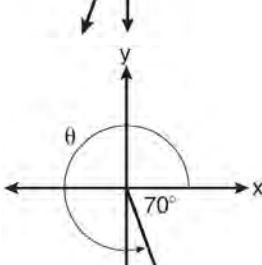
1) $\frac{8}{5}$

2) -3

3) 3

4) 9

388 Which graph does *not* represent a function?

1)

2)

3)

4)

389 If $\tan A = \frac{2}{3}$ and $\sin B = \frac{5}{\sqrt{41}}$ and angles A and B are in Quadrant I, find the value of $\tan(A + B)$.

390 In which graph is θ coterminal with an angle of $-70°$?

1)

2)

3)

4)

391 The roots of the equation $x^2 - 10x + 25 = 0$ are

1) imaginary

2) real and irrational

3) real, rational, and equal

4) real, rational, and unequal

392 Solve algebraically for x: $\dfrac{1}{x+3} - \dfrac{2}{3-x} = \dfrac{4}{x^2-9}$

393 Three marbles are to be drawn at random, without replacement, from a bag containing 15 red marbles, 10 blue marbles, and 5 white marbles. Which expression can be used to calculate the probability of drawing 2 red marbles and 1 white marble from the bag?

1) $\dfrac{{}_{15}C_2 \cdot {}_5C_1}{{}_{30}C_3}$

2) $\dfrac{{}_{15}P_2 \cdot {}_5P_1}{{}_{30}C_3}$

3) $\dfrac{{}_{15}C_2 \cdot {}_5C_1}{{}_{30}P_3}$

4) $\dfrac{{}_{15}P_2 \cdot {}_5P_1}{{}_{30}P_3}$

394 Find the sum and product of the roots of the equation $5x^2 + 11x - 3 = 0$.

395 What is the radian measure of the smaller angle formed by the hands of a clock at 7 o'clock?

1) $\dfrac{\pi}{2}$

2) $\dfrac{2\pi}{3}$

3) $\dfrac{5\pi}{6}$

4) $\dfrac{7\pi}{6}$

396 The solution set of the equation $\sqrt{x+3} = 3 - x$ is
1) $\{1\}$
2) $\{0\}$
3) $\{1,6\}$
4) $\{2,3\}$

397 The expression $\dfrac{2x+4}{\sqrt{x+2}}$ is equivalent to

1) $\dfrac{(2x+4)\sqrt{x-2}}{x-2}$

2) $\dfrac{(2x+4)\sqrt{x-2}}{x-4}$

3) $2\sqrt{x-2}$

4) $2\sqrt{x+2}$

398 The expression $(3 - 7i)^2$ is equivalent to
1) $-40 + 0i$
2) $-40 - 42i$
3) $58 + 0i$
4) $58 - 42i$

399 What is the fifteenth term of the sequence $5, -10, 20, -40, 80, \ldots$?
1) $-163,840$
2) $-81,920$
3) $81,920$
4) $327,680$

400 Solve algebraically for x: $\log_{x+3} \dfrac{x^3 + x - 2}{x} = 2$

401 The roots of the equation $2x^2 + 7x - 3 = 0$ are

1) $-\dfrac{1}{2}$ and -3

2) $\dfrac{1}{2}$ and 3

3) $\dfrac{-7 \pm \sqrt{73}}{4}$

4) $\dfrac{7 \pm \sqrt{73}}{4}$

402 Which task is *not* a component of an observational study?
1) The researcher decides who will make up the sample.
2) The researcher analyzes the data received from the sample.
3) The researcher gathers data from the sample, using surveys or taking measurements.
4) The researcher divides the sample into two groups, with one group acting as a control group.

403 Express in simplest form: $\dfrac{\dfrac{1}{2} - \dfrac{4}{d}}{\dfrac{1}{d} + \dfrac{3}{2d}}$

404 In a study of 82 video game players, the researchers found that the ages of these players were normally distributed, with a mean age of 17 years and a standard deviation of 3 years. Determine if there were 15 video game players in this study over the age of 20. Justify your answer.

405 What is the solution of the equation $2\log_4(5x) = 3$?
1) 6.4
2) 2.56
3) $\dfrac{9}{5}$
4) $\dfrac{8}{5}$

406 What is the common ratio of the geometric sequence whose first term is 27 and fourth term is 64?

1) $\dfrac{3}{4}$

2) $\dfrac{64}{81}$

3) $\dfrac{4}{3}$

4) $\dfrac{37}{3}$

407 What is the value of x in the equation $9^{3x+1} = 27^{x+2}$?
1) 1
2) $\dfrac{1}{3}$
3) $\dfrac{1}{2}$
4) $\dfrac{4}{3}$

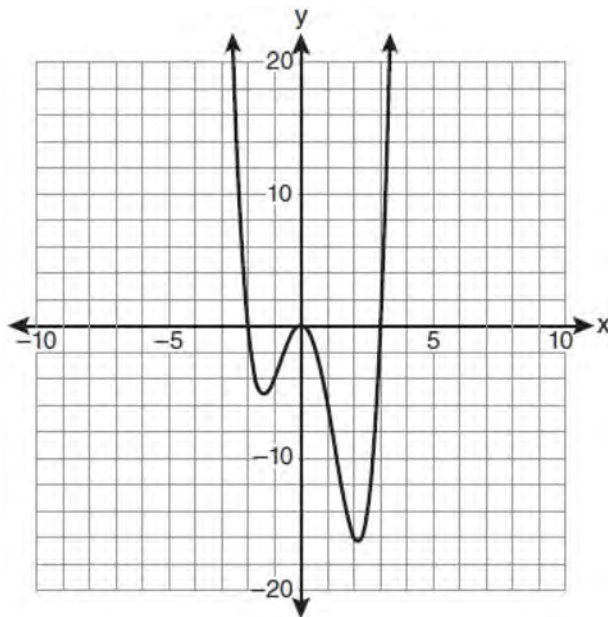408 What is the coefficient of the fourth term in the expansion of $(a - 4b)^9$?
1) $-5,376$
2) -336
3) 336
4) $5,376$

409 When $\frac{3}{2}x^2 - \frac{1}{4}x - 4$ is subtracted from

$\frac{5}{2}x^2 - \frac{3}{4}x + 1$, the difference is

1) $-x^2 + \frac{1}{2}x - 5$

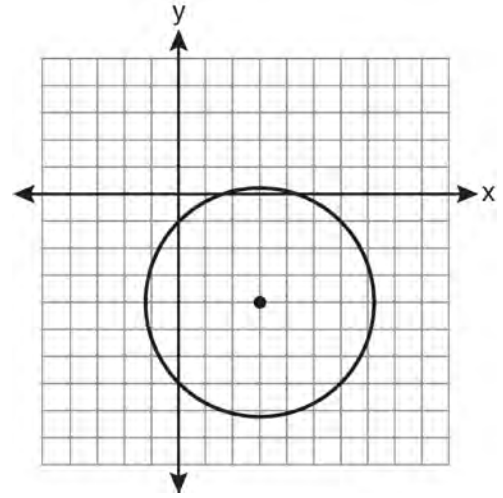2) $x^2 - \frac{1}{2}x + 5$

3) $-x^2 - x - 3$

4) $x^2 - x - 3$

410 The graph of $y = f(x)$ is shown below.

Which set lists all the real solutions of $f(x) = 0$?
1) $\{-3,2\}$
2) $\{-2,3\}$
3) $\{-3,0,2\}$
4) $\{-2,0,3\}$

411 Which equation represents the circle shown in the graph below that passes through the point $(0,-1)$?

1) $(x-3)^2 + (y+4)^2 = 16$
2) $(x-3)^2 + (y+4)^2 = 18$
3) $(x+3)^2 + (y-4)^2 = 16$
4) $(x+3)^2 + (y-4)^2 = 18$

412 If $\angle A$ is acute and $\tan A = \frac{2}{3}$, then

1) $\cot A = \frac{2}{3}$

2) $\cot A = \frac{1}{3}$

3) $\cot(90° - A) = \frac{2}{3}$

4) $\cot(90° - A) = \frac{1}{3}$

413 If θ is an angle in standard position and its terminal side passes through the point $(-3,2)$, find the exact value of $\csc \theta$.

414 The expression $\cos 4x \cos 3x + \sin 4x \sin 3x$ is equivalent to
1) $\sin x$
2) $\sin 7x$
3) $\cos x$
4) $\cos 7x$

415 In $\triangle ABC$, $m\angle A = 74$, $a = 59.2$, and $c = 60.3$. What are the two possible values for $m\angle C$, to the *nearest tenth*?
1) 73.7 and 106.3
2) 73.7 and 163.7
3) 78.3 and 101.7
4) 78.3 and 168.3

416 Solve the following systems of equations algebraically: $5 = y - x$
$$4x^2 = -17x + y + 4$$

417 Use the discriminant to determine all values of k that would result in the equation $x^2 - kx + 4 = 0$ having equal roots.

418 If $f(x) = \dfrac{x}{x^2 - 16}$, what is the value of $f(-10)$?
1) $-\dfrac{5}{2}$
2) $-\dfrac{5}{42}$
3) $\dfrac{5}{58}$
4) $\dfrac{5}{18}$

419 The solutions of the equation $y^2 - 3y = 9$ are
1) $\dfrac{3 \pm 3i\sqrt{3}}{2}$
2) $\dfrac{3 \pm 3i\sqrt{5}}{2}$
3) $\dfrac{-3 \pm 3\sqrt{5}}{2}$
4) $\dfrac{3 \pm 3\sqrt{5}}{2}$

420 Which equation is sketched in the diagram below?
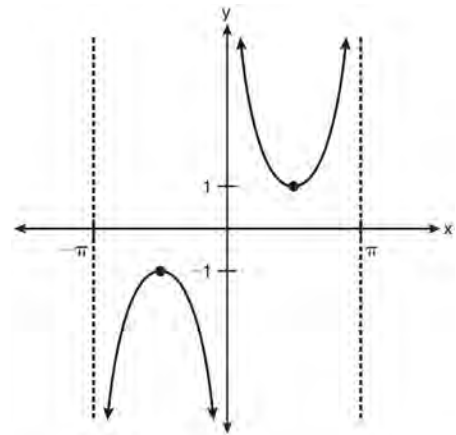
1) $y = \csc x$
2) $y = \sec x$
3) $y = \cot x$
4) $y = \tan x$

421 Solve the equation $8x^3 + 4x^2 - 18x - 9 = 0$ algebraically for all values of x.

57

422 Which equation is represented by the graph below?
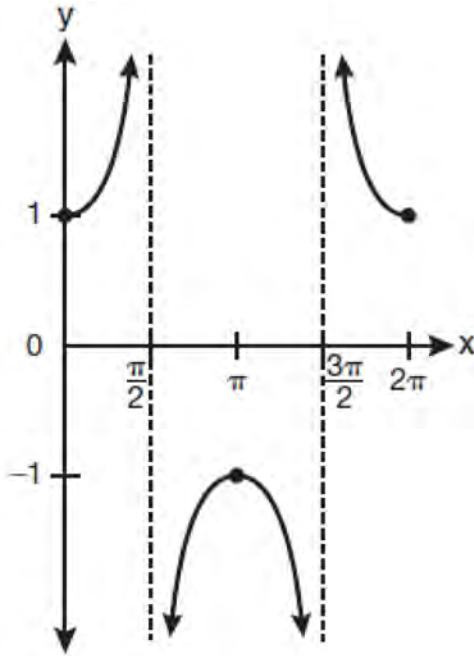
1) $y = \cot x$
2) $y = \csc x$
3) $y = \sec x$
4) $y = \tan x$

423 A study shows that 35% of the fish caught in a local lake had high levels of mercury. Suppose that 10 fish were caught from this lake. Find, to the *nearest tenth of a percent,* the probability that *at least* 8 of the 10 fish caught did *not* contain high levels of mercury.

424 The conjugate of $7 - 5i$ is
1) $-7 - 5i$
2) $-7 + 5i$
3) $7 - 5i$
4) $7 + 5i$

425 What are the values of θ in the interval $0° \le \theta < 360°$ that satisfy the equation $\tan\theta - \sqrt{3} = 0$?
1) 60°, 240°
2) 72°, 252°
3) 72°, 108°, 252°, 288°
4) 60°, 120°, 240°, 300°

426 In a triangle, two sides that measure 6 cm and 10 cm form an angle that measures 80°. Find, to the *nearest degree*, the measure of the smallest angle in the triangle.

427 Which two functions are inverse functions of each other?
1) $f(x) = \sin x$ and $g(x) = \cos(x)$
2) $f(x) = 3 + 8x$ and $g(x) = 3 - 8x$
3) $f(x) = e^x$ and $g(x) = \ln x$
4) $f(x) = 2x - 4$ and $g(x) = -\frac{1}{2}x + 4$

428 Express $\left(\frac{2}{3}x - 1\right)^2$ as a trinomial.

429 Four points on the graph of the function f(x) are shown below.
$$\{(0,1),(1,2),(2,4),(3,8)\}$$
Which equation represents f(x)?
1) $f(x) = 2^x$
2) $f(x) = 2x$
3) $f(x) = x + 1$
4) $f(x) = \log_2 x$

430 Ms. Bell's mathematics class consists of 4 sophomores, 10 juniors, and 5 seniors. How many different ways can Ms. Bell create a four-member committee of juniors if each junior has an equal chance of being selected?
1) 210
2) 3,876
3) 5,040
4) 93,024

431 Akeem invests $25,000 in an account that pays 4.75% annual interest compounded continuously.

Using the formula $A = Pe^{rt}$, where A = the amount in the account after t years, P = principal invested, and r = the annual interest rate, how many years, to the *nearest tenth*, will it take for Akeem's investment to triple?
1) 10.0
2) 14.6
3) 23.1
4) 24.0

432 The scores of one class on the Unit 2 mathematics test are shown in the table below.

Unit 2 Mathematics Test

Test Score	Frequency
96	1
92	2
84	5
80	3
76	6
72	3
68	2

Find the population standard deviation of these scores, to the *nearest tenth*.

433 If $f(x) = x^2 - 5$ and $g(x) = 6x$, then $g(f(x))$ is equal to
1) $6x^3 - 30x$
2) $6x^2 - 30$
3) $36x^2 - 5$
4) $x^2 + 6x - 5$

434 The graph of $y = x^3 - 4x^2 + x + 6$ is shown below.
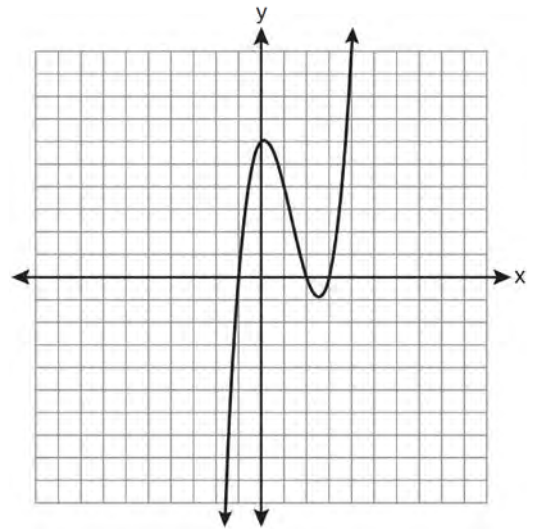
What is the product of the roots of the equation $x^3 - 4x^2 + x + 6 = 0$?
1) −36
2) −6
3) 6
4) 4

435 The expression $\cos^2 \theta - \cos 2\theta$ is equivalent to
1) $\sin^2 \theta$
2) $-\sin^2 \theta$
3) $\cos^2 \theta + 1$
4) $-\cos^2 \theta - 1$

436 The expression $\log_5\left(\dfrac{1}{25}\right)$ is equivalent to

1) $\dfrac{1}{2}$

2) 2

3) $-\dfrac{1}{2}$

4) -2

437 If $r = \sqrt[3]{\dfrac{A^2 B}{C}}$, then $\log r$ can be represented by

1) $\dfrac{1}{6}\log A + \dfrac{1}{3}\log B - \log C$

2) $3(\log A^2 + \log B - \log C)$

3) $\dfrac{1}{3}\log(A^2 + B) - C$

4) $\dfrac{2}{3}\log A + \dfrac{1}{3}\log B - \dfrac{1}{3}\log C$

438 The number of minutes students took to complete a quiz is summarized in the table below.

Minutes	14	15	16	17	18	19	20
Number of Students	5	3	x	5	2	10	1

If the mean number of minutes was 17, which equation could be used to calculate the value of x?

1) $17 = \dfrac{119 + x}{x}$

2) $17 = \dfrac{119 + 16x}{x}$

3) $17 = \dfrac{446 + x}{26 + x}$

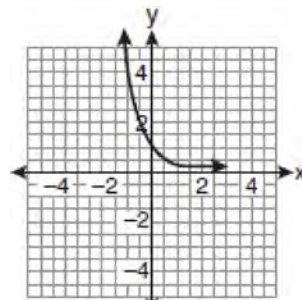4) $17 = \dfrac{446 + 16x}{26 + x}$

439 If a function is defined by the equation $f(x) = 4^x$, which graph represents the inverse of this function?
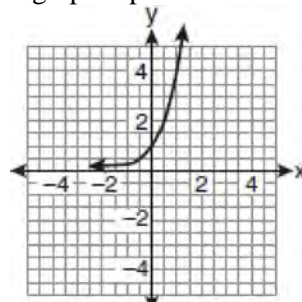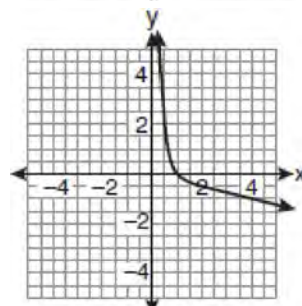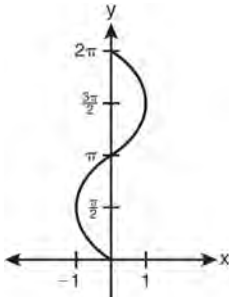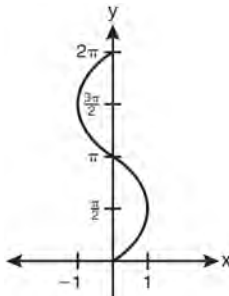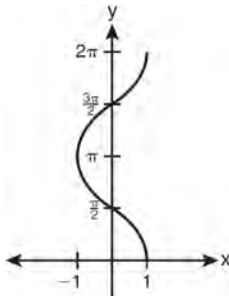

1)
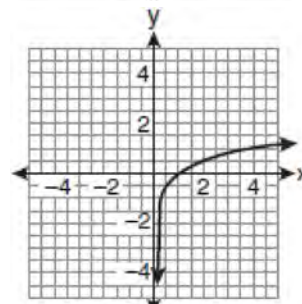
2)

3)

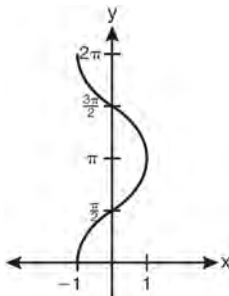

4)

440 Which graph shows $y = \cos^{-1} x$?

1)

2)

3)

4)

441 The function $f(x) = \tan x$ is defined in such a way that $f^{-1}(x)$ is a function. What can be the domain of $f(x)$?

1) $\{x \mid 0 \le x \le \pi\}$
2) $\{x \mid 0 \le x \le 2\pi\}$
3) $\left\{ x \mid -\dfrac{\pi}{2} < x < \dfrac{\pi}{2} \right\}$
4) $\left\{ x \mid -\dfrac{\pi}{2} < x < \dfrac{3\pi}{2} \right\}$

442 If $a = 3$ and $b = -2$, what is the value of the expression $\dfrac{a^{-2}}{b^{-3}}$?

1) $-\dfrac{9}{8}$
2) -1
3) $-\dfrac{8}{9}$
4) $\dfrac{8}{9}$

443 Simplify the expression $\dfrac{3x^{-4} y^5}{(2x^3 y^{-7})^{-2}}$ and write the answer using only positive exponents.

444 In $\triangle ABC$, $m\angle A = 120$, $b = 10$, and $c = 18$. What is the area of $\triangle ABC$ to the *nearest square inch*?

1) 52
2) 78
3) 90
4) 156

61

445 The sides of a parallelogram measure 10 cm and 18 cm. One angle of the parallelogram measures 46 degrees. What is the area of the parallelogram, to the *nearest square centimeter*?
1) 65
2) 125
3) 129
4) 162

446 The solution set of $4^{x^2+4x} = 2^{-6}$ is
1) {1,3}
2) {−1,3}
3) {−1,−3}
4) {1,−3}

447 Express the product of $\left(\dfrac{1}{2}y^2 - \dfrac{1}{3}y\right)$ and $\left(12y + \dfrac{3}{5}\right)$ as a trinomial.

448 The value of x in the equation $4^{2x+5} = 8^{3x}$ is
1) 1
2) 2
3) 5
4) −10

449 Matt places $1,200 in an investment account earning an annual rate of 6.5%, compounded continuously. Using the formula $V = Pe^{rt}$, where V is the value of the account in t years, P is the principal initially invested, e is the base of a natural logarithm, and r is the rate of interest, determine the amount of money, to the *nearest cent*, that Matt will have in the account after 10 years.

450 On January 1, a share of a certain stock cost $180. Each month thereafter, the cost of a share of this stock decreased by one-third. If x represents the time, in months, and y represents the cost of the stock, in dollars, which graph best represents the cost of a share over the following 5 months?
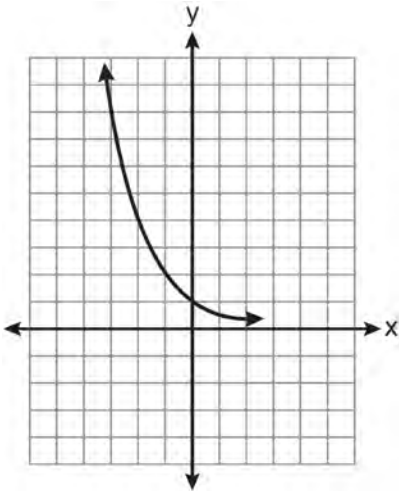
1)

2)

3)

4)
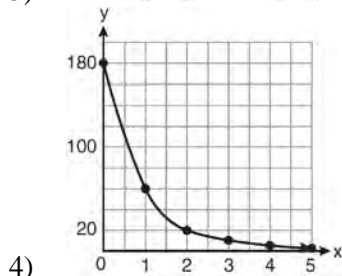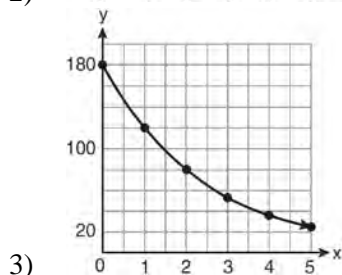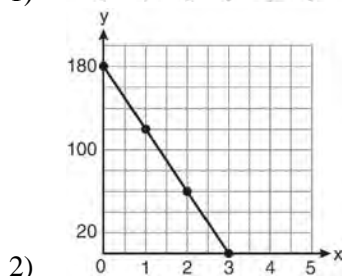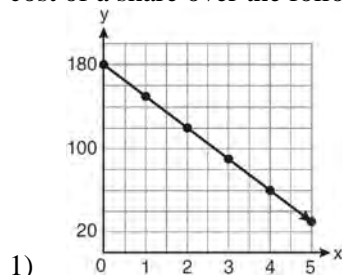
451 Starting with $\sin^2 A + \cos^2 A = 1$, derive the formula $\tan^2 A + 1 = \sec^2 A$.

452 The solution set of the inequality $x^2 - 3x > 10$ is
1) $\{x \mid -2 < x < 5\}$
2) $\{x \mid 0 < x < 3\}$
3) $\{x \mid x < -2 \text{ or } x > 5\}$
4) $\{x \mid x < -5 \text{ or } x > 2\}$

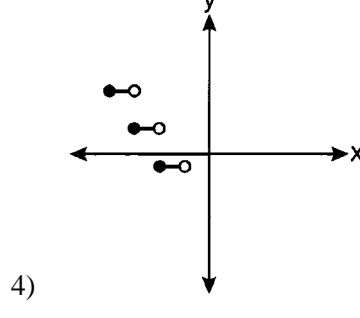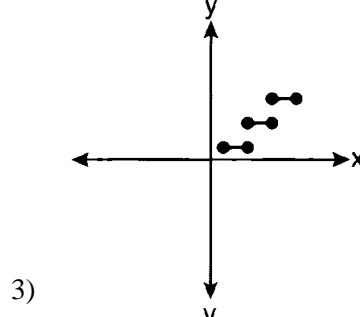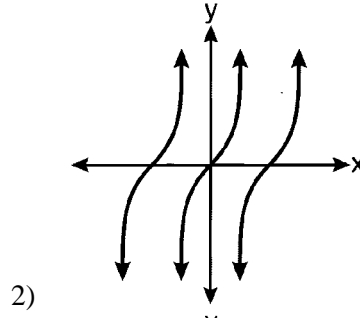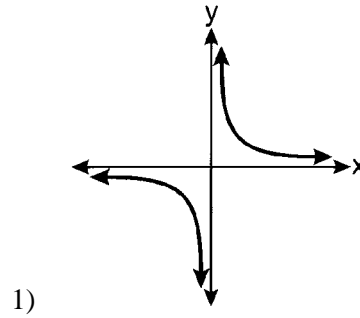453 When $x^{-1} - 1$ is divided by $x - 1$, the quotient is
1) -1
2) $-\dfrac{1}{x}$
3) $\dfrac{1}{x^2}$
4) $\dfrac{1}{(x-1)^2}$

454 Which equation is represented by the graph below?

1) $y = 5^x$
2) $y = 0.5^x$
3) $y = 5^{-x}$
4) $y = 0.5^{-x}$

455 Which graph represents a relation that is *not* a function?

1)

2)

3)

4)

456 Express $5\sqrt{3x^3} - 2\sqrt{27x^3}$ in simplest radical form.

457 The members of a men's club have a choice of wearing black or red vests to their club meetings. A study done over a period of many years determined that the percentage of black vests worn is 60%. If there are 10 men at a club meeting on a given night, what is the probability, to the *nearest thousandth*, that *at least* 8 of the vests worn will be black?

458 What is the period of the function $f(\theta) = -2\cos 3\theta$?
1) π
2) $\dfrac{2\pi}{3}$
3) $\dfrac{3\pi}{2}$
4) 2π

459 Express as a single fraction the exact value of $\sin 75°$.

460 In $\triangle ABC$, $a = 3$, $b = 5$, and $c = 7$. What is $m\angle C$?
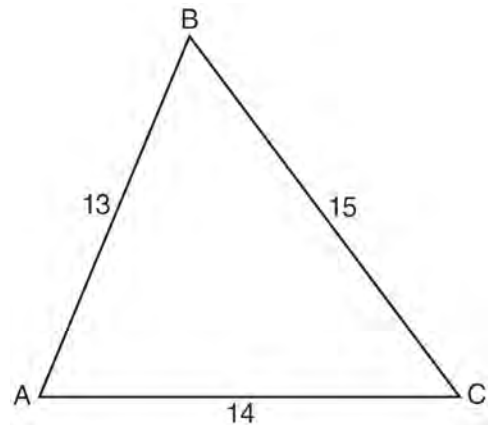1) 22
2) 38
3) 60
4) 120

461 Graph the inequality $-3|6 - x| < -15$ for x. Graph the solution on the line below.

462 Write an equation of the circle shown in the graph below.
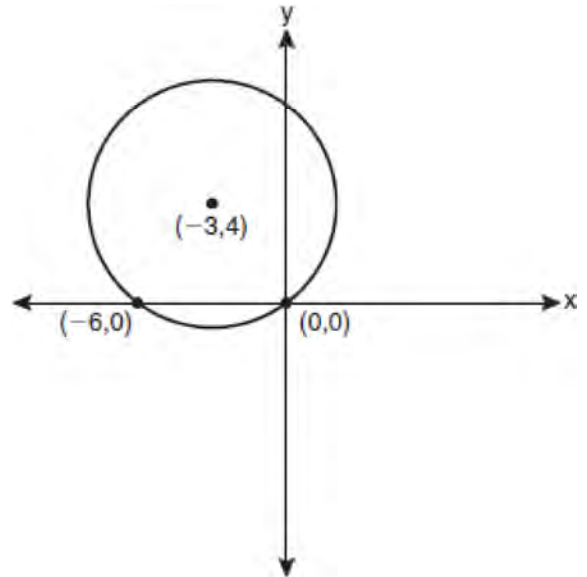
463 In $\triangle ABC$, $a = 15$, $b = 14$, and $c = 13$, as shown in the diagram below. What is the $m\angle C$, to the *nearest degree*?

1) 53
2) 59
3) 67
4) 127

64

464 The temperature, T, of a given cup of hot chocolate after it has been cooling for t minutes can best be modeled by the function below, where T_0 is the temperature of the room and k is a constant.
$$\ln(T - T_0) = -kt + 4.718$$
A cup of hot chocolate is placed in a room that has a temperature of 68°. After 3 minutes, the temperature of the hot chocolate is 150°. Compute the value of k to the nearest thousandth. [Only an algebraic solution can receive full credit.] Using this value of k, find the temperature, T, of this cup of hot chocolate if it has been sitting in this room for a total of 10 minutes. Express your answer to the *nearest degree*. [Only an algebraic solution can receive full credit.]

465 Find all values of θ in the interval $0° \le \theta < 360°$ that satisfy the equation $\sin 2\theta = \sin \theta$.

466 In $\triangle ABC$, m$\angle A = 32$, $a = 12$, and $b = 10$. Find the measures of the missing angles and side of $\triangle ABC$. Round each measure to the *nearest tenth*.

467 How many distinct triangles can be formed if m$\angle A = 35$, $a = 10$, and $b = 13$?
1) 1
2) 2
3) 3
4) 0

468 What is the conjugate of $-2 + 3i$?
1) $-3 + 2i$
2) $-2 - 3i$
3) $2 - 3i$
4) $3 + 2i$

469 Written in simplest form, the expression $\dfrac{\dfrac{x}{4} - \dfrac{1}{x}}{\dfrac{1}{2x} + \dfrac{1}{4}}$ is equivalent to
1) $x - 1$
2) $x - 2$
3) $\dfrac{x - 2}{2}$
4) $\dfrac{x^2 - 4}{x + 2}$

470 In the diagram below of right triangle JTM, $JT = 12$, $JM = 6$, and m$\angle JMT = 90$.
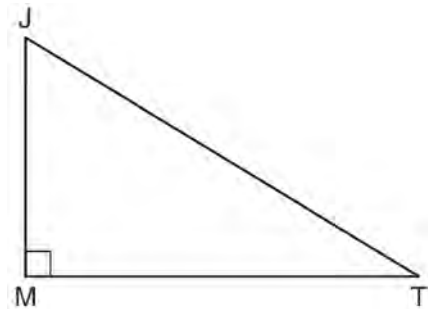
What is the value of $\cot J$?
1) $\dfrac{\sqrt{3}}{3}$
2) 2
3) $\sqrt{3}$
4) $\dfrac{2\sqrt{3}}{3}$

471 Express the sum $7 + 14 + 21 + 28 + \ldots + 105$ using sigma notation.

472 Samantha constructs the scatter plot below from a set of data.
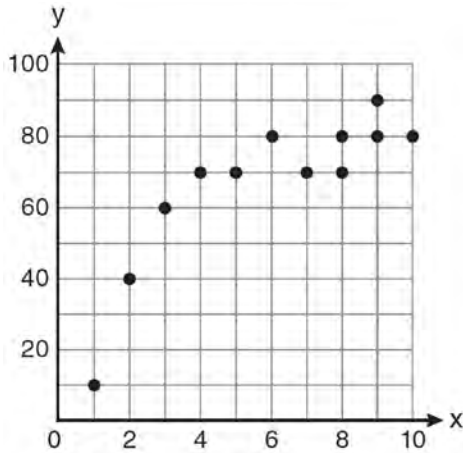
Based on her scatter plot, which regression model would be most appropriate?
1) exponential
2) linear
3) logarithmic
4) power

473 The value of the expression $\sum_{r=3}^{5}(-r^2 + r)$ is

1) −38
2) −12
3) 26
4) 62

474 What is the fourth term in the expansion of $(3x - 2)^5$?

1) $-720x^2$
2) $-240x$
3) $720x^2$
4) $1,080x^3$

475 What is a formula for the nth term of sequence B shown below?
$$B = 10, 12, 14, 16, \ldots$$

1) $b_n = 8 + 2n$
2) $b_n = 10 + 2n$
3) $b_n = 10(2)^n$
4) $b_n = 10(2)^{n-1}$

476 Mrs. Hill asked her students to express the sum $1 + 3 + 5 + 7 + 9 + \ldots + 39$ using sigma notation. Four different student answers were given. Which student answer is correct?
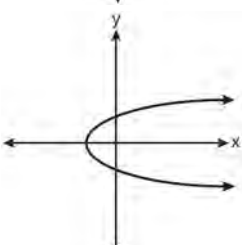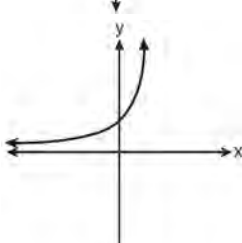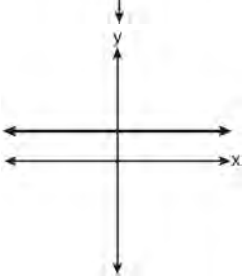
1) $\sum_{k=1}^{20}(2k - 1)$

2) $\sum_{k=2}^{40}(k - 1)$

3) $\sum_{k=-1}^{37}(k + 2)$

4) $\sum_{k=1}^{39}(2k - 1)$

477 The expression $(x^2 - 1)^{-\frac{2}{3}}$ is equivalent to

1) $\sqrt[3]{(x^2 - 1)^2}$

2) $\dfrac{1}{\sqrt[3]{(x^2 - 1)^2}}$

3) $\sqrt{(x^2 - 1)^3}$

4) $\dfrac{1}{\sqrt{(x^2 - 1)^3}}$

478 If $f(x) = \frac{1}{2}x - 3$ and $g(x) = 2x + 5$, what is the value of $(g \circ f)(4)$?
1) -13
2) 3.5
3) 3
4) 6

479 Factored completely, the expression $6x - x^3 - x^2$ is equivalent to
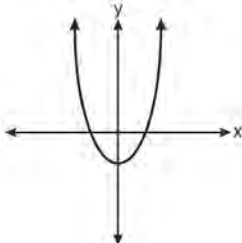1) $x(x+3)(x-2)$
2) $x(x-3)(x+2)$
3) $-x(x-3)(x+2)$
4) $-x(x+3)(x-2)$

480 The expression $x^{-\frac{2}{5}}$ is equivalent to
1) $-\sqrt[2]{x^5}$
2) $-\sqrt[5]{x^2}$
3) $\dfrac{1}{\sqrt[2]{x^5}}$
4) $\dfrac{1}{\sqrt[5]{x^2}}$

481 Factored completely, the expression $12x^4 + 10x^3 - 12x^2$ is equivalent to
1) $x^2(4x+6)(3x-2)$
2) $2(2x^2+3x)(3x^2-2x)$
3) $2x^2(2x-3)(3x+2)$
4) $2x^2(2x+3)(3x-2)$

482 The principal would like to assemble a committee of 8 students from the 15-member student council. How many different committees can be chosen?
1) 120
2) 6,435
3) 32,432,400
4) 259,459,200

483 Which arithmetic sequence has a common difference of 4?
1) $\{0, 4n, 8n, 12n, \dots\}$
2) $\{n, 4n, 16n, 64n, \dots\}$
3) $\{n+1, n+5, n+9, n+13, \dots\}$
4) $\{n+4, n+16, n+64, n+256, \dots\}$

484 Two forces of 25 newtons and 85 newtons acting on a body form an angle of 55°. Find the magnitude of the resultant force, to the *nearest hundredth of a newton*. Find the measure, to the *nearest degree*, of the angle formed between the resultant and the larger force.

485 What is the fifteenth term of the geometric sequence $-\sqrt{5}, \sqrt{10}, -2\sqrt{5}, \dots$?
1) $-128\sqrt{5}$
2) $128\sqrt{10}$
3) $-16384\sqrt{5}$
4) $16384\sqrt{10}$

486 Find, to the *nearest minute*, the angle whose measure is 3.45 radians.

487 Which graph represents a one-to-one function?

1)

2)

3)

4)

488 Twenty different cameras will be assigned to several boxes. Three cameras will be randomly selected and assigned to box A. Which expression can be used to calculate the number of ways that three cameras can be assigned to box A?
1) $20!$
2) $\dfrac{20!}{3!}$
3) $_{20}C_3$
4) $_{20}P_3$
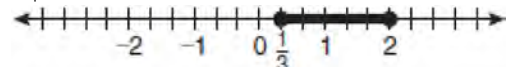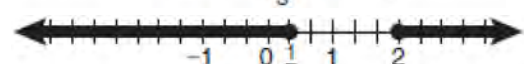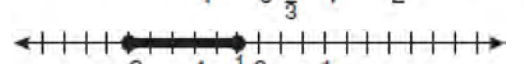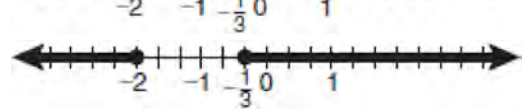
489 The solution set of $\sqrt{3x+16} = x+2$ is
1) $\{-3,4\}$
2) $\{-4,3\}$
3) $\{3\}$
4) $\{-4\}$

490 The minimum point on the graph of the equation $y = f(x)$ is $(-1,-3)$. What is the minimum point on the graph of the equation $y = f(x) + 5$?
1) $(-1,2)$
2) $(-1,-8)$
3) $(4,-3)$
4) $(-6,-3)$

491 Which graph represents the solution set of $|6x - 7| \le 5$?

1)

2)

3)

4)

492 For which equation does the sum of the roots equal -3 and the product of the roots equal 2?
1) $x^2 + 2x - 3 = 0$
2) $x^2 - 3x + 2 = 0$
3) $2x^2 + 6x + 4 = 0$
4) $2x^2 - 6x + 4 = 0$

68

493 In the diagram below of a unit circle, the ordered pair $\left(-\dfrac{\sqrt{2}}{2}, -\dfrac{\sqrt{2}}{2}\right)$ represents the point where the terminal side of θ intersects the unit circle.
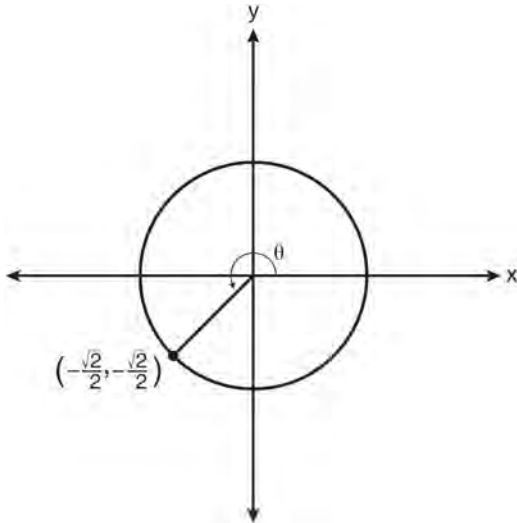
What is $m\angle\theta$?
1) 45
2) 135
3) 225
4) 240

494 Which expression is equivalent to $\dfrac{\sqrt{3}+5}{\sqrt{3}-5}$?

1) $-\dfrac{14+5\sqrt{3}}{11}$

2) $-\dfrac{17+5\sqrt{3}}{11}$

3) $\dfrac{14+5\sqrt{3}}{14}$

4) $\dfrac{17+5\sqrt{3}}{14}$

495 The value of the expression $2\sum\limits_{n=0}^{2}(n^2+2^n)$ is
1) 12
2) 22
3) 24
4) 26

496 Expressed as a function of a positive acute angle, $\cos(-305°)$ is equal to
1) $-\cos 55°$
2) $\cos 55°$
3) $-\sin 55°$
4) $\sin 55°$

497 What is the range of $f(x)=(x+4)^2+7$?
1) $y \geq -4$
2) $y \geq 4$
3) $y = 7$
4) $y \geq 7$

498 Howard collected fish eggs from a pond behind his house so he could determine whether sunlight had an effect on how many of the eggs hatched. After he collected the eggs, he divided them into two tanks. He put both tanks outside near the pond, and he covered one of the tanks with a box to block out all sunlight. State whether Howard's investigation was an example of a controlled experiment, an observation, or a survey. Justify your response.

499 Which value of r represents data with a strong negative linear correlation between two variables?
1) -1.07
2) -0.89
3) -0.14
4) 0.92

500 The expression $\log_8 64$ is equivalent to
1) 8
2) 2
3) $\dfrac{1}{2}$
4) $\dfrac{1}{8}$

501 Brian correctly used a method of completing the square to solve the equation $x^2 + 7x - 11 = 0$. Brian's first step was to rewrite the equation as $x^2 + 7x = 11$. He then added a number to both sides of the equation. Which number did he add?
1) $\dfrac{7}{2}$
2) $\dfrac{49}{4}$
3) $\dfrac{49}{2}$
4) 49

502 For which equation does the sum of the roots equal $\dfrac{3}{4}$ and the product of the roots equal -2?
1) $4x^2 - 8x + 3 = 0$
2) $4x^2 + 8x + 3 = 0$
3) $4x^2 - 3x - 8 = 0$
4) $4x^2 + 3x - 2 = 0$

503 What is the value of x in the equation $\log_5 x = 4$?
1) 1.16
2) 20
3) 625
4) $1,024$

504 What is the solution set of the equation $|4a + 6| - 4a = -10$?
1) $\varnothing$
2) $\{0\}$
3) $\left\{ \dfrac{1}{2} \right\}$
4) $\left\{ 0, \dfrac{1}{2} \right\}$

505 A survey completed at a large university asked 2,000 students to estimate the average number of hours they spend studying each week. Every tenth student entering the library was surveyed. The data showed that the mean number of hours that students spend studying was 15.7 per week. Which characteristic of the survey could create a bias in the results?
1) the size of the sample
2) the size of the population
3) the method of analyzing the data
4) the method of choosing the students who were surveyed

506 If $x^2 + 2 = 6x$ is solved by completing the square, an intermediate step would be
1) $(x + 3)^2 = 7$
2) $(x - 3)^2 = 7$
3) $(x - 3)^2 = 11$
4) $(x - 6)^2 = 34$

507 On the unit circle shown in the diagram below, sketch an angle, in standard position, whose degree measure is 240 and find the exact value of $\sin 240°$.
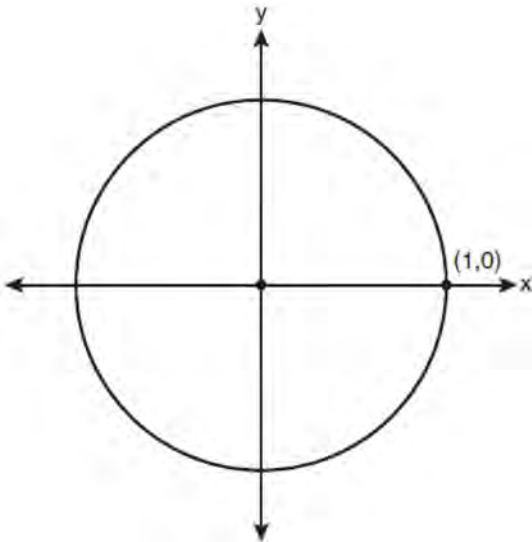
508 If $\sin A = \dfrac{2}{3}$ where $0° < A < 90°$, what is the value of $\sin 2A$?

1) $\dfrac{2\sqrt{5}}{3}$

2) $\dfrac{2\sqrt{5}}{9}$

3) $\dfrac{4\sqrt{5}}{9}$

4) $-\dfrac{4\sqrt{5}}{9}$

509 Solve the equation $2\tan C - 3 = 3\tan C - 4$ algebraically for all values of C in the interval $0° \le C < 360°$.

510 Which graph represents one complete cycle of the equation $y = \sin 3\pi x$?
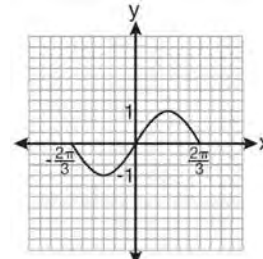
1)
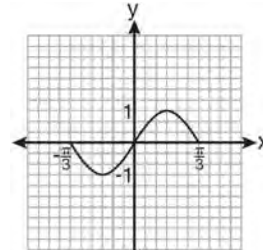
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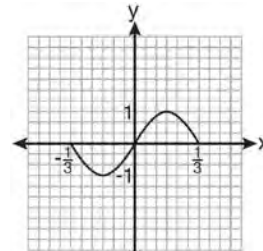
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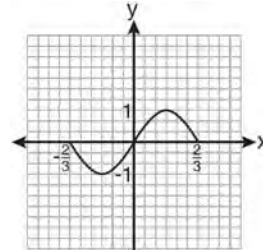
4)

511 Find the total number of different twelve-letter arrangements that can be formed using the letters in the word *PENNSYLVANIA*.

512 When simplified, the expression $\left(\dfrac{w^{-5}}{w^{-9}}\right)^{\frac{1}{2}}$ is

equivalent to
1) w^{-7}
2) w^2
3) w^7
4) w^{14}

513 The graph of the equation $y = \left(\dfrac{1}{2}\right)^x$ has an

asymptote. On the grid below, sketch the graph of

$y = \left(\dfrac{1}{2}\right)^x$ and write the equation of this asymptote.
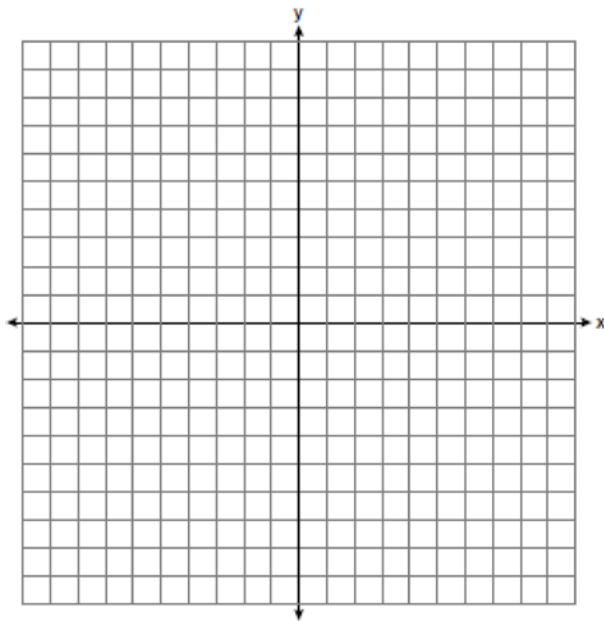
514 Evaluate: $10 + \sum\limits_{n=1}^{5}(n^3 - 1)$

515 In the diagram below of right triangle KTW, $KW = 6$, $KT = 5$, and $m\angle KTW = 90$.
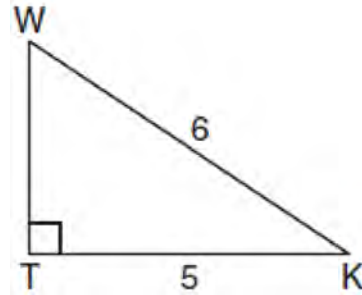
What is the measure of $\angle K$, to the *nearest minute*?
1) 33°33'
2) 33°34'
3) 33°55'
4) 33°56'

516 The table below shows the results of an experiment involving the growth of bacteria.

Time (x) (in minutes)	1	3	5	7	9	11
Number of Bacteria (y)	2	25	81	175	310	497

Write a power regression equation for this set of data, rounding all values to *three decimal places*. Using this equation, predict the bacteria's growth, to the *nearest integer*, after 15 minutes.

517 An amateur bowler calculated his bowling average for the season. If the data are normally distributed, about how many of his 50 games were within one standard deviation of the mean?
1) 14
2) 17
3) 34
4) 48

518 What is the formula for the nth term of the sequence $54, 18, 6, \ldots$?

1) $a_n = 6\left(\dfrac{1}{3}\right)^n$

2) $a_n = 6\left(\dfrac{1}{3}\right)^{n-1}$

3) $a_n = 54\left(\dfrac{1}{3}\right)^n$

4) $a_n = 54\left(\dfrac{1}{3}\right)^{n-1}$

519 In simplest form, $\sqrt{-300}$ is equivalent to

1) $3i\sqrt{10}$
2) $5i\sqrt{12}$
3) $10i\sqrt{3}$
4) $12i\sqrt{5}$

520 A committee of 5 members is to be randomly selected from a group of 9 teachers and 20 students. Determine how many different committees can be formed if 2 members must be teachers and 3 members must be students.

521 Write a quadratic equation such that the sum of its roots is 6 and the product of its roots is -27.

522 The roots of the equation $9x^2 + 3x - 4 = 0$ are
1) imaginary
2) real, rational, and equal
3) real, rational, and unequal
4) real, irrational, and unequal

523 Evaluate $e^{x \ln y}$ when $x = 3$ and $y = 2$.

524 If $f(x) = x^2 - 6$, find $f^{-1}(x)$.

525 For a given set of rectangles, the length is inversely proportional to the width. In one of these rectangles, the length is 12 and the width is 6. For this set of rectangles, calculate the width of a rectangle whose length is 9.

526 A doctor wants to test the effectiveness of a new drug on her patients. She separates her sample of patients into two groups and administers the drug to only one of these groups. She then compares the results. Which type of study *best* describes this situation?
1) census
2) survey
3) observation
4) controlled experiment

527 The letters of any word can be rearranged. Carol believes that the number of different 9-letter arrangements of the word "TENNESSEE" is greater than the number of different 7-letter arrangements of the word "VERMONT." Is she correct? Justify your answer.

528 If $f(x) = x^2 - 6$ and $g(x) = 2^x - 1$, determine the value of $(g \circ f)(-3)$.

529 The expression $\dfrac{\sin^2\theta + \cos^2\theta}{1 - \sin^2\theta}$ is equivalent to

1) $\cos^2\theta$
2) $\sin^2\theta$
3) $\sec^2\theta$
4) $\csc^2\theta$

530 The fraction $\dfrac{3}{\sqrt{3a^2 b}}$ is equivalent to

1) $\dfrac{1}{a\sqrt{b}}$

2) $\dfrac{\sqrt{b}}{ab}$

3) $\dfrac{\sqrt{3b}}{ab}$

4) $\dfrac{\sqrt{3}}{a}$

531 A circle has a radius of 4 inches. In inches, what is the length of the arc intercepted by a central angle of 2 radians?
1) 2π
2) 2
3) 8π
4) 8

532 The value of $\tan 126°43'$ to the *nearest ten-thousandth* is
1) -1.3407
2) -1.3408
3) -1.3548
4) -1.3549

533 What is the period of the function $y = \dfrac{1}{2}\sin\left(\dfrac{x}{3} - \pi\right)$?

1) $\dfrac{1}{2}$

2) $\dfrac{1}{3}$

3) $\dfrac{2}{3}\pi$

4) 6π

534 Express $\dfrac{\sqrt{108x^5 y^8}}{\sqrt{6xy^5}}$ in simplest radical form.

535 Find the first four terms of the recursive sequence defined below.
$$a_1 = -3$$
$$a_n = a_{(n-1)} - n$$

536 Factor the expression $12t^8 - 75t^4$ completely.

537 The product of $(3 + \sqrt{5})$ and $(3 - \sqrt{5})$ is
1) $4 - 6\sqrt{5}$
2) $14 - 6\sqrt{5}$
3) 14
4) 4

538 Which graph best represents the inequality
$y + 6 \geq x^2 - x$?
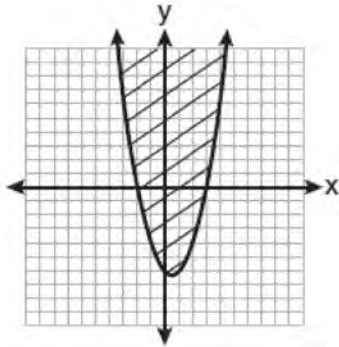
1)
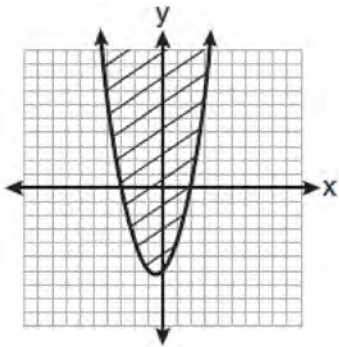
2)
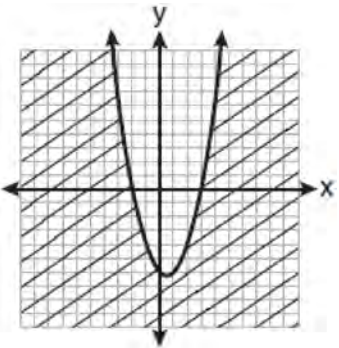
3)
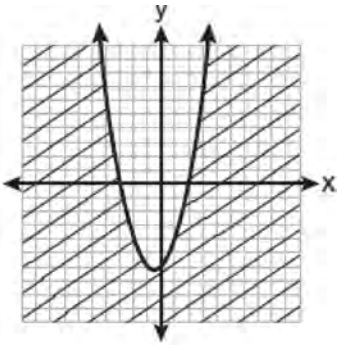
4)

539 Find, to the *nearest tenth of a degree*, the angle whose measure is 2.5 radians.

540 The lengths of 100 pipes have a normal distribution with a mean of 102.4 inches and a standard deviation of 0.2 inch. If one of the pipes measures exactly 102.1 inches, its length lies
1) below the 16th percentile
2) between the 50th and 84th percentiles
3) between the 16th and 50th percentiles
4) above the 84th percentile

541 The table below shows the number of new stores in a coffee shop chain that opened during the years 1986 through 1994.

Year	Number of New Stores
1986	14
1987	27
1988	48
1989	80
1990	110
1991	153
1992	261
1993	403
1994	681

Using $x = 1$ to represent the year 1986 and y to represent the number of new stores, write the exponential regression equation for these data. Round all values to the *nearest thousandth*.

542 The expression $2i^2 + 3i^3$ is equivalent to
1) $-2 - 3i$
2) $2 - 3i$
3) $-2 + 3i$
4) $2 + 3i$

543 Write the binomial expansion of $(2x - 1)^5$ as a polynomial in simplest form.

544 Which formula can be used to determine the total number of different eight-letter arrangements that can be formed using the letters in the word *DEADLINE*?
1) $8!$
2) $\dfrac{8!}{4!}$
3) $\dfrac{8!}{2! + 2!}$
4) $\dfrac{8!}{2! \cdot 2!}$

545 The expression $2\log x - (3\log y + \log z)$ is equivalent to
1) $\log \dfrac{x^2}{y^3 z}$
2) $\log \dfrac{x^2 z}{y^3}$
3) $\log \dfrac{2x}{3yz}$
4) $\log \dfrac{2xz}{3y}$

546 A four-digit serial number is to be created from the digits 0 through 9. How many of these serial numbers can be created if 0 can *not* be the first digit, no digit may be repeated, and the last digit must be 5?
1) 448
2) 504
3) 2,240
4) 2,520

Algebra 2/Trigonometry Regents at Random
Answer Section

354 ANS: 1

$$\sqrt[4]{16x^2y^7} = 16^{\frac{1}{4}}x^{\frac{2}{4}}y^{\frac{7}{4}} = 2x^{\frac{1}{2}}y^{\frac{7}{4}}$$

PTS: 2   REF: 061107a2   STA: A2.A.11   TOP: Radicals as Fractional Exponents

355 ANS:

$$16^{2x+3} = 64^{x+2}$$

$$(4^2)^{2x+3} = (4^3)^{x+2}$$

$$4x + 6 = 3x + 6$$

$$x = 0$$

PTS: 2   REF: 011128a2   STA: A2.A.27   TOP: Exponential Equations
KEY: common base not shown

356 ANS: 2

$$\frac{11\pi}{12} \cdot \frac{180}{\pi} = 165$$

PTS: 2   REF: 061002a2   STA: A2.M.2   TOP: Radian Measure
KEY: degrees

357 ANS:

$$\frac{51}{243}. \quad {}_5C_3\left(\frac{1}{3}\right)^3\left(\frac{2}{3}\right)^2 = \frac{40}{243}$$

$$\phantom{\frac{51}{243}.}\quad {}_5C_4\left(\frac{1}{3}\right)^4\left(\frac{2}{3}\right)^1 = \frac{10}{243}$$

$$\phantom{\frac{51}{243}.}\quad {}_5C_3\left(\frac{1}{3}\right)^5\left(\frac{2}{3}\right)^0 = \frac{1}{243}$$

PTS: 4   REF: 061138a2   STA: A2.S.15   TOP: Binomial Probability
KEY: at least or at most

358 ANS: 1   PTS: 2   REF: 061013a2   STA: A2.A.38
TOP: Defining Functions

359 ANS:

$$\frac{5(3+\sqrt{2})}{7} \cdot \quad \frac{5}{3-\sqrt{2}} \times \frac{3+\sqrt{2}}{3+\sqrt{2}} = \frac{5(3+\sqrt{2})}{9-2} = \frac{5(3+\sqrt{2})}{7}$$

PTS: 2   REF: fall0928a2   STA: A2.N.5   TOP: Rationalizing Denominators

360 ANS: 4

(4) fails the horizontal line test. Not every element of the range corresponds to only one element of the domain.

PTS: 2   REF: fall0906a2   STA: A2.A.43   TOP: Defining Functions

361 ANS:

$(x + 5)^2 + (y - 3)^2 = 32$

PTS: 2   REF: 081033a2   STA: A2.A.49   TOP: Writing Equations of Circles

362 ANS:

$10ax^2 - 23ax - 5a = a(10x^2 - 23x - 5) = a(5x + 1)(2x - 5)$

PTS: 2   REF: 081028a2   STA: A2.A.7   TOP: Factoring Polynomials

KEY: multiple variables

363 ANS: 4

$y - 2\sin\theta = 3$

$y = 2\sin\theta + 3$

$f(\theta) = 2\sin\theta + 3$

PTS: 2   REF: fall0927a2   STA: A2.A.40   TOP: Functional Notation

364 ANS:

68% of the students are within one standard deviation of the mean. 16% of the students are more than one standard deviation above the mean.

PTS: 2   REF: 011134a2   STA: A2.S.5   TOP: Normal Distributions

KEY: percent

365 ANS:

$K = ab\sin C = 24 \cdot 30\sin 57 \approx 604$

PTS: 2   REF: 061034a2   STA: A2.A.74   TOP: Using Trigonometry to Find Area

KEY: parallelograms

366 ANS: 3   PTS: 2   REF: fall0923a2   STA: A2.A.39

TOP: Domain and Range   KEY: real domain

367 ANS: 2

$x^2 - 2x + y^2 + 6y = -3$

$x^2 - 2x + 1 + y^2 + 6y + 9 = -3 + 1 + 9$

$(x - 1)^2 + (y + 3)^2 = 7$

PTS: 2   REF: 061016a2   STA: A2.A.47   TOP: Equations of Circles

368 ANS: 3   PTS: 2   REF: fall0913a2   STA: A2.A.65

TOP: Graphing Trigonometric Functions

369 ANS: 4

$$S_n = \frac{n}{2}[2a + (n-1)d] = \frac{21}{2}[2(18) + (21-1)2] = 798$$

PTS: 2   REF: 061103a2   STA: A2.A.35   TOP: Series
KEY: arithmetic

370 ANS: 2

$$x^2 - x - 6 = 3x - 6$$

$$x^2 - 4x = 0$$

$$x(x-4) = 0$$

$$x = 0, 4$$

PTS: 2   REF: 081015a2   STA: A2.A.3   TOP: Quadratic-Linear Systems
KEY: equations

371 ANS:

$$0.468. \quad _8C_6\left(\frac{2}{3}\right)^6\left(\frac{1}{3}\right)^2 \approx 0.27313. \quad _8C_7\left(\frac{2}{3}\right)^7\left(\frac{1}{3}\right)^1 \approx 0.15607. \quad _8C_8\left(\frac{2}{3}\right)^8\left(\frac{1}{3}\right)^0 \approx 0.03902.$$

PTS: 4   REF: 011138a2   STA: A2.S.15   TOP: Binomial Probability
KEY: at least or at most

372 ANS: 3

$$\frac{4}{5-\sqrt{13}} \cdot \frac{5+\sqrt{13}}{5+\sqrt{13}} = \frac{4(5+\sqrt{13})}{25-13} = \frac{5+\sqrt{13}}{3}$$

PTS: 2   REF: 061116a2   STA: A2.N.5   TOP: Rationalizing Denominators

373 ANS: 2   PTS: 2   REF: fall0926a2   STA: A2.A.46
TOP: Transformations with Functions and Relations

374 ANS: 1   PTS: 2   REF: 061019a2   STA: A2.N.7
TOP: Imaginary Numbers

375 ANS: 2
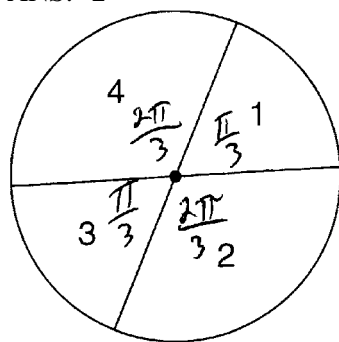
$$\frac{\frac{\pi}{3}+\frac{\pi}{3}}{2\pi} = \frac{\frac{2\pi}{3}}{2\pi} = \frac{1}{3}$$

PTS: 2   REF: 011108a2   STA: A2.S.13   TOP: Geometric Probability

376 ANS: 1   PTS: 2   REF: fall0914a2   STA: A2.A.9
TOP: Negative and Fractional Exponents

377 ANS: 1

$$-420\left(\frac{\pi}{180}\right) = -\frac{7\pi}{3}$$

PTS: 2 REF: 081002a2 STA: A2.M.2 TOP: Radian Measure
KEY: radians

378 ANS:
D: $-5 \le x \le 8$. R: $-3 \le y \le 2$

PTS: 2 REF: 011132a2 STA: A2.A.51 TOP: Domain and Range

379 ANS: 3 PTS: 2 REF: 081007a2 STA: A2.A.64
TOP: Using Inverse Trigonometric Functions KEY: basic

380 ANS: 2 PTS: 2 REF: 081010a2 STA: A2.A.55
TOP: Trigonometric Ratios

381 ANS: 4

$$4ab\sqrt{2b} - 3a\sqrt{9b^2}\sqrt{2b} + 7ab\sqrt{6b} = 4ab\sqrt{2b} - 9ab\sqrt{2b} + 7ab\sqrt{6b} = -5ab\sqrt{2b} + 7ab\sqrt{6b}$$

PTS: 2 REF: fall0918a2 STA: A2.A.14 TOP: Operations with Radicals
KEY: with variables | index = 2

382 ANS: 2

$$x^3 + x^2 - 2x = 0$$

$$x(x^2 + x - 2) = 0$$

$$x(x + 2)(x - 1) = 0$$

$$x = 0, -2, 1$$

PTS: 2 REF: 011103a2 STA: A2.A.26 TOP: Solving Polynomial Equations

383 ANS:

no solution. $\dfrac{4x}{x-3} = 2 + \dfrac{12}{x-3}$

$$\dfrac{4x - 12}{x - 3} = 2$$

$$\dfrac{4(x - 3)}{x - 3} = 2$$

$$4 \ne 2$$

PTS: 2 REF: fall0930a2 STA: A2.A.23 TOP: Solving Rationals
KEY: rational solutions

384 ANS: 2 PTS: 2 REF: 081003a2 STA: A2.A.51
TOP: Domain and Range

4

385 ANS:

$3 \pm \sqrt{7}$. $2x^2 - 12x + 4 = 0$

$$x^2 - 6x + 2 = 0$$

$$x^2 - 6x = -2$$

$$x^2 - 6x + 9 = -2 + 9$$

$$(x - 3)^2 = 7$$

$$x - 3 = \pm\sqrt{7}$$

$$x = 3 \pm \sqrt{7}$$

PTS: 4   REF: fall0936a2   STA: A2.A.24   TOP: Completing the Square

386 ANS: 1   PTS: 2   REF: 011112a2   STA: A2.A.64
TOP: Using Inverse Trigonometric Functions   KEY: advanced

387 ANS: 3   PTS: 2   REF: 061001a2   STA: A2.A.30
TOP: Sequences

388 ANS: 4   PTS: 2   REF: 011101a2   STA: A2.A.38
TOP: Defining Functions   KEY: graphs

389 ANS:

$\dfrac{23}{2}$ $\cos^2 B + \sin^2 B = 1$ $\tan B = \dfrac{\sin B}{\cos B} = \dfrac{\frac{5}{\sqrt{41}}}{\frac{4}{\sqrt{41}}} = \dfrac{5}{4}$ $\tan(A + B) = \dfrac{\frac{2}{3} + \frac{5}{4}}{1 - \left(\frac{2}{3}\right)\left(\frac{5}{4}\right)} = \dfrac{\frac{8+15}{12}}{\frac{12}{12} - \frac{10}{12}} = \dfrac{\frac{23}{12}}{\frac{2}{12}} = \dfrac{23}{2}$

$$\cos^2 B + \left(\frac{5}{\sqrt{41}}\right)^2 = 1$$

$$\cos^2 B + \frac{25}{41} = \frac{41}{41}$$

$$\cos^2 B = \frac{16}{41}$$

$$\cos B = \frac{4}{\sqrt{41}}$$

PTS: 4   REF: 081037a2   STA: A2.A.76   TOP: Angle Sum and Difference Identities
KEY: evaluating

390 ANS: 4   PTS: 2   REF: 081005a2   STA: A2.A.60
TOP: Unit Circle

391 ANS: 3

$$b^2 - 4ac = (-10)^2 - 4(1)(25) = 100 - 100 = 0$$

PTS: 2   REF: 011102a2   STA: A2.A.2   TOP: Using the Discriminant
KEY: determine nature of roots given equation

392 ANS:

$$\frac{1}{3} \quad \frac{1}{x+3} - \frac{2}{3-x} = \frac{4}{x^2-9}$$

$$\frac{1}{x+3} + \frac{2}{x-3} = \frac{4}{x^2-9}$$

$$\frac{x-3+2(x+3)}{(x+3)(x-3)} = \frac{4}{(x+3)(x-3)}$$

$$x-3+2x+6 = 4$$

$$3x = 1$$

$$x = \frac{1}{3}$$

PTS: 4   REF: 081036a2   STA: A2.A.23   TOP: Solving Rationals
KEY: rational solutions

393 ANS: 1   PTS: 2   REF: 011117a2   STA: A2.S.9
TOP: Differentiating Permutations and Combinations

394 ANS:

Sum $\frac{-b}{a} = -\frac{11}{5}$. Product $\frac{c}{a} = -\frac{3}{5}$

PTS: 2   REF: 061030a2   STA: A2.A.20   TOP: Roots of Quadratics

395 ANS: 3

$$2\pi \cdot \frac{5}{12} = \frac{10\pi}{12} = \frac{5\pi}{6}$$

PTS: 2   REF: 061125a2   STA: A2.M.1   TOP: Radian Measure

396 ANS: 1   PTS: 2   REF: 061018a2   STA: A2.A.22
TOP: Solving Radicals   KEY: extraneous solutions

397 ANS: 4

$$\frac{2x+4}{\sqrt{x+2}} \cdot \frac{\sqrt{x+2}}{\sqrt{x+2}} = \frac{2(x+2)\sqrt{x+2}}{x+2} = 2\sqrt{x+2}$$

PTS: 2   REF: 011122a2   STA: A2.A.15   TOP: Rationalizing Denominators
KEY: index = 2

398 ANS: 2

$$(3-7i)(3-7i) = 9 - 21i - 21i + 49i^2 = 9 - 42i - 49 = -40 - 42i$$

PTS: 2   REF: fall0901a2   STA: A2.N.9
TOP: Multiplication and Division of Complex Numbers

399 ANS: 3

$$a_n = 5(-2)^{n-1}$$

$$a_{15} = 5(-2)^{15-1} = 81{,}920$$

PTS: 2   REF: 011105a2   STA: A2.A.32   TOP: Sequences

400 ANS:

$$x = -\frac{1}{3}, -1 \quad \log_{x+3} \frac{x^3 + x - 2}{x} = 2$$

$$\frac{x^3 + x - 2}{x} = (x+3)^2$$

$$\frac{x^3 + x - 2}{x} = x^2 + 6x + 9$$

$$x^3 + x - 2 = x^3 + 6x^2 + 9x$$

$$0 = 6x^2 + 8x + 2$$

$$0 = 3x^2 + 4x + 1$$

$$0 = (3x+1)(x+1)$$

$$x = -\frac{1}{3}, -1$$

PTS: 6   REF: 081039a2   STA: A2.A.28   TOP: Logarithmic Equations
KEY: basic

401 ANS: 3

$$\frac{-7 \pm \sqrt{7^2 - 4(2)(-3)}}{2(2)} = \frac{-7 \pm \sqrt{73}}{4}$$

PTS: 2   REF: 081009a2   STA: A2.A.25   TOP: Quadratics with Irrational Solutions

402 ANS: 4   PTS: 2   REF: 011127a2   STA: A2.S.1
TOP: Analysis of Data

403 ANS:

$$\frac{\frac{1}{2} - \frac{4}{d}}{\frac{1}{d} + \frac{3}{2d}} = \frac{\frac{d-8}{2d}}{\frac{2d+3d}{2d^2}} = \frac{d-8}{2d} \times \frac{2d^2}{5d} = \frac{d-8}{5}$$

PTS: 2   REF: 061035a2   STA: A2.A.17   TOP: Complex Fractions

404 ANS:

no. over 20 is more than 1 standard deviation above the mean. $0.159 \cdot 82 \approx 13.038$

PTS: 2   REF: 061129a2   STA: A2.S.5   TOP: Normal Distributions
KEY: predict

405 ANS: 4

$2\log_4(5x) = 3$

$\log_4(5x) = \dfrac{3}{2}$

$5x = 4^{\frac{3}{2}}$

$5x = 8$

$x = \dfrac{8}{5}$

PTS: 2   REF: fall0921a2   STA: A2.A.28   TOP: Logarithmic Equations
KEY: advanced

406 ANS: 3

$27r^{4-1} = 64$

$r^3 = \dfrac{64}{27}$

$r = \dfrac{4}{3}$

PTS: 2   REF: 081025a2   STA: A2.A.31   TOP: Sequences

407 ANS: 4

$9^{3x+1} = 27^{x+2}$.

$(3^2)^{3x+1} = (3^3)^{x+2}$

$3^{6x+2} = 3^{3x+6}$

$6x + 2 = 3x + 6$

$3x = 4$

$x = \dfrac{4}{3}$

PTS: 2   REF: 081008a2   STA: A2.A.27   TOP: Exponential Equations
KEY: common base not shown

408 ANS: 1

${}_9C_3 a^6(-4b)^3 = -5376a^6b^3$

PTS: 2   REF: 061126a2   STA: A2.A.36   TOP: Binomial Expansions

409 ANS: 2   PTS: 2   REF: 011114a2   STA: A2.N.3
TOP: Operations with Polynomials

410 ANS: 4   PTS: 2   REF: 061005a2   STA: A2.A.50
TOP: Solving Polynomial Equations

411 ANS: 2   PTS: 2   REF: 011126a2   STA: A2.A.49
TOP: Equations of Circles

412 ANS: 3
Cofunctions tangent and cotangent are complementary

PTS: 2 REF: 061014a2 STA: A2.A.58 TOP: Cofunction Trigonometric Relationships

413 ANS:

$\dfrac{\sqrt{13}}{2}$. $\sin \theta = \dfrac{y}{\sqrt{x^2 + y^2}} = \dfrac{2}{\sqrt{(-3)^2 + 2^2}} = \dfrac{2}{\sqrt{13}}$. $\csc \theta = \dfrac{\sqrt{13}}{2}$.

PTS: 2 REF: fall0933a2 STA: A2.A.62 TOP: Determining Trigonometric Functions

414 ANS: 3 PTS: 2 REF: fall0910a2 STA: A2.A.76
TOP: Angle Sum and Difference Identities KEY: simplifying

415 ANS: 3

$\dfrac{59.2}{\sin 74} = \dfrac{60.3}{\sin C}$ $\quad 180 - 78.3 = 101.7$

$\quad C \approx 78.3$

PTS: 2 REF: 081006a2 STA: A2.A.75 TOP: Law of Sines - The Ambiguous Case

416 ANS:

$\left(-\dfrac{9}{2}, \dfrac{1}{2}\right)$ and $\left(\dfrac{1}{2}, \dfrac{11}{2}\right)$. $\quad y = x + 5 \qquad$. $\quad 4x^2 + 17x - 4 = x + 5$

$\qquad\qquad\qquad\qquad\qquad y = 4x^2 + 17x - 4 \quad 4x^2 + 16x - 9 = 0$

$\qquad\qquad\qquad\qquad\qquad\qquad\qquad\qquad (2x + 9)(2x - 1) = 0$

$\qquad\qquad\qquad\qquad\qquad\qquad\qquad\qquad x = -\dfrac{9}{2}$ and $x = \dfrac{1}{2}$

$\qquad\qquad\qquad\qquad\qquad\qquad\qquad\qquad y = -\dfrac{9}{2} + 5 = \dfrac{1}{2}$ and $y = \dfrac{1}{2} + 5 = \dfrac{11}{2}$

PTS: 6 REF: 061139a2 STA: A2.A.3 TOP: Quadratic-Linear Systems
KEY: equations

417 ANS:

$\qquad b^2 - 4ac = 0$

$\quad k^2 - 4(1)(4) = 0$

$\qquad k^2 - 16 = 0$

$(k + 4)(k - 4) = 0$

$\qquad\qquad k = \pm 4$

PTS: 2 REF: 061028a2 STA: A2.A.2 TOP: Using the Discriminant
KEY: determine equation given nature of roots

418 ANS: 2

$$f(10) = \frac{-10}{(-10)^2 - 16} = \frac{-10}{84} = -\frac{5}{42}$$

PTS: 2   REF: 061102a2   STA: A2.A.41   TOP: Functional Notation

419 ANS: 4

$$\frac{3 \pm \sqrt{(-3)^2 - 4(1)(-9)}}{2(1)} = \frac{3 \pm \sqrt{45}}{2} = \frac{3 \pm 3\sqrt{5}}{2}$$

PTS: 2   REF: 061009a2   STA: A2.A.25   TOP: Quadratics with Irrational Solutions

420 ANS: 1
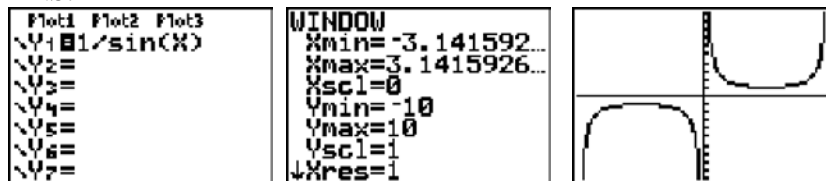
PTS: 2   REF: 011123a2   STA: A2.A.71   TOP: Graphing Trigonometric Functions

421 ANS:

$$\pm\frac{3}{2}, -\frac{1}{2}. \qquad 8x^3 + 4x^2 - 18x - 9 = 0$$

$$4x^2(2x + 1) - 9(2x + 1) = 0$$

$$(4x^2 - 9)(2x + 1) = 0$$

$$4x^2 - 9 = 0 \text{ or } 2x + 1 = 0$$

$$(2x + 3)(2x - 3) = 0 \qquad x = -\frac{1}{2}$$

$$x = \pm\frac{3}{2}$$

PTS: 4   REF: fall0937a2   STA: A2.A.26   TOP: Solving Polynomial Equations

422 ANS: 3
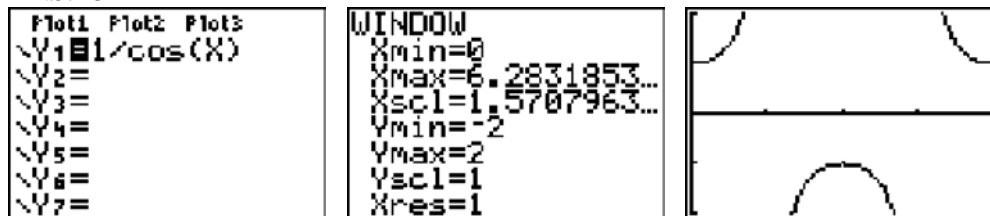
PTS: 2   REF: 061020a2   STA: A2.A.71   TOP: Graphing Trigonometric Functions

423 ANS:

26.2%. $_{10}C_8 \cdot 0.65^8 \cdot 0.35^2 +_{10}C_9 \cdot 0.65^9 \cdot 0.35^1 +_{10}C_{10} \cdot 0.65^{10} \cdot 0.35^0 \approx 0.262$

PTS: 4   REF: 081038a2   STA: A2.S.15   TOP: Binomial Probability
KEY: at least or at most

424 ANS: 4   PTS: 2   REF: 011111a2   STA: A2.N.8
TOP: Conjugates of Complex Numbers

425 ANS: 1

$\tan \theta - \sqrt{3} = 0$

$\tan \theta = \sqrt{3}$

$\theta = \tan^{-1} \sqrt{3}$

$\theta = 60, 240$
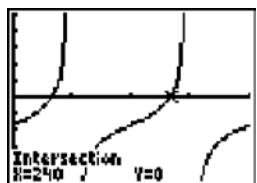
PTS: 2   REF: fall0903a2   STA: A2.A.68   TOP: Trigonometric Equations
KEY: basic

426 ANS:

33. $a = \sqrt{10^2 + 6^2 - 2(10)(6)\cos 80} \approx 10.7$. $\angle C$ is opposite the shortest side. $\dfrac{6}{\sin C} = \dfrac{10.7}{\sin 80}$

$C \approx 33$

PTS: 6   REF: 061039a2   STA: A2.A.73   TOP: Law of Cosines
KEY: advanced

427 ANS: 3   PTS: 2   REF: 081027a2   STA: A2.A.44
TOP: Inverse of Functions   KEY: equations

428 ANS:

$\dfrac{4}{9}x^2 - \dfrac{4}{3}x + 1$. $\left(\dfrac{2}{3}x - 1\right)^2 = \left(\dfrac{2}{3}x - 1\right)\left(\dfrac{2}{3}x - 1\right) = \dfrac{4}{9}x^2 - \dfrac{2}{3}x - \dfrac{2}{3}x + 1 = \dfrac{4}{9}x^2 - \dfrac{4}{3}x + 1$

PTS: 2   REF: 081034a2   STA: A2.N.3   TOP: Operations with Polynomials

429 ANS: 1   PTS: 2   REF: 061004a2   STA: A2.A.52
TOP: Identifying the Equation of a Graph

430 ANS: 1

$_{10}C_4 = 210$

PTS: 2   REF: 061113a2   STA: A2.S.11   TOP: Combinations

431 ANS: 3

$75000 = 25000e^{.0475t}$

$3 = e^{.0475t}$

$\ln 3 = \ln e^{.0475t}$

$\dfrac{\ln 3}{.0475} = \dfrac{.0475t \cdot \ln e}{.0475}$

$23.1 \approx t$

PTS: 2   REF: 061117a2   STA: A2.A.6   TOP: Exponential Growth

432 ANS:

7.4

PTS: 2   REF: 061029a2   STA: A2.S.4   TOP: Dispersion
KEY: basic, group frequency distributions

433 ANS: 2

$6(x^2 - 5) = 6x^2 - 30$

PTS: 2   REF: 011109a2   STA: A2.A.42   TOP: Compositions of Functions
KEY: variables

434 ANS: 2
The roots are $-1, 2, 3$.

PTS: 2   REF: 081023a2   STA: A2.A.50   TOP: Solving Polynomial Equations

435 ANS: 1

$\cos^2 \theta - \cos 2\theta = \cos^2 \theta - (\cos^2 \theta - \sin^2 \theta) = \sin^2 \theta$

PTS: 2   REF: 061024a2   STA: A2.A.77   TOP: Double Angle Identities
KEY: simplifying

436 ANS: 4   PTS: 2   REF: 011124a2   STA: A2.A.18
TOP: Evaluating Logarithmic Expressions

437 ANS: 4   PTS: 2   REF: 061120a2   STA: A2.A.19
TOP: Properties of Logarithms   KEY: splitting logs

438 ANS: 4   PTS: 2   REF: 061124a2   STA: A2.S.3
TOP: Average Known with Missing Data

439 ANS: 2

$f^{-1}(x) = \log_4 x$

PTS: 2   REF: fall0916a2   STA: A2.A.54   TOP: Graphing Logarithmic Functions

440 ANS: 3   PTS: 2   REF: 061119a2   STA: A2.A.65
TOP: Graphing Trigonometric Functions

441 ANS: 3   PTS: 2   REF: 061022a2   STA: A2.A.63
TOP: Domain and Range

442 ANS: 3

$$\frac{3^{-2}}{(-2)^{-3}} = \frac{\frac{1}{9}}{-\frac{1}{8}} = -\frac{8}{9}$$

PTS: 2   REF: 061003a2   STA: A2.N.1   TOP: Negative and Fractional Exponents
443 ANS:

$$\frac{12x^2}{y^9} \cdot \frac{3x^{-4}y^5}{(2x^3y^{-7})^{-2}} = \frac{3y^5(2x^3y^{-7})^2}{x^4} = \frac{3y^5(4x^6y^{-14})}{x^4} = \frac{12x^6y^{-9}}{x^4} = \frac{12x^2}{y^9}$$

PTS: 2   REF: 061134a2   STA: A2.A.9   TOP: Negative Exponents
444 ANS: 2

$$K = \frac{1}{2}(10)(18)\sin 120 = 45\sqrt{3} \approx 78$$

PTS: 2   REF: fall0907a2   STA: A2.A.74   TOP: Using Trigonometry to Find Area
KEY: basic
445 ANS: 3
$$K = (10)(18)\sin 46 \approx 129$$

PTS: 2   REF: 081021a2   STA: A2.A.74   TOP: Using Trigonometry to Find Area
KEY: parallelograms
446 ANS: 3

$$4^{x^2+4x} = 2^{-6}. \qquad 2x^2 + 8x = -6$$
$$(2^2)^{x^2+4x} = 2^{-6} \qquad 2x^2 + 8x + 6 = 0$$
$$2^{2x^2+8x} = 2^{-6} \qquad x^2 + 4x + 3 = 0$$
$$(x+3)(x+1) = 0$$
$$x = -3 \; x = -1$$

PTS: 2   REF: 061015a2   STA: A2.A.27   TOP: Exponential Equations
KEY: common base shown
447 ANS:

$$6y^3 - \frac{37}{10}y^2 - \frac{1}{5}y. \quad \left(\frac{1}{2}y^2 - \frac{1}{3}y\right)\left(12y + \frac{3}{5}\right) = 6y^3 + \frac{3}{10}y^2 - 4y^2 - \frac{1}{5}y = 6y^3 - \frac{37}{10}y^2 - \frac{1}{5}y$$

PTS: 2   REF: 061128a2   STA: A2.N.3   TOP: Operations with Polynomials

448 ANS: 2

$$4^{2x+5} = 8^{3x} \qquad .$$

$$\left(2^2\right)^{2x+5} = \left(2^3\right)^{3x}$$

$$2^{4x+10} = 2^{9x}$$
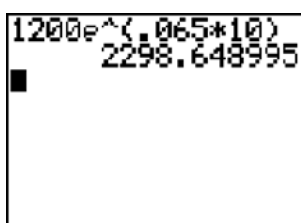
$$4x + 10 = 9x$$

$$10 = 5x$$

$$2 = x$$

PTS: 2 REF: 061105a2 STA: A2.A.27 TOP: Exponential Equations
KEY: common base not shown

449 ANS:

2,298.65.

PTS: 2 REF: fall0932a2 STA: A2.A.12 TOP: Evaluating Exponential Expressions

450 ANS: 3 PTS: 2 REF: 011119a2 STA: A2.A.52
TOP: Families of Functions

451 ANS:

$$\frac{\sin^2 A}{\cos^2 A} + \frac{\cos^2 A}{\cos^2 A} = \frac{1}{\cos^2 A}$$

$$\tan^2 A + 1 = \sec^2 A$$

PTS: 2 REF: 011135a2 STA: A2.A.67 TOP: Proving Trigonometric Identities

452 ANS: 3

$$x^2 - 3x - 10 > 0 \qquad\qquad \text{or}$$

$$(x-5)(x+2) > 0 \qquad x - 5 < 0 \text{ and } x + 2 < 0$$

$$x - 5 > 0 \text{ and } x + 2 > 0 \qquad x < 5 \text{ and } x < -2$$

$$x > 5 \text{ and } x > -2 \qquad\qquad x < -2$$

$$x > 5$$

PTS: 2 REF: 011115a2 STA: A2.A.4 TOP: Quadratic Inequalities
KEY: one variable

453 ANS: 2

$$\frac{x^{-1}-1}{x-1} = \frac{\frac{1}{x}-1}{x-1} = \frac{\frac{1-x}{x}}{x-1} = \frac{\frac{-(x-1)}{x}}{x-1} = -\frac{1}{x}$$

PTS: 2   REF: 081018a2   STA: A2.A.9   TOP: Negative Exponents

454 ANS: 2   PTS: 2   REF: 061108a2   STA: A2.A.52
TOP: Identifying the Equation of a Graph

455 ANS: 3   PTS: 2   REF: 061114a2   STA: A2.A.38
TOP: Defining Functions   KEY: graphs

456 ANS:

$$5\sqrt{3x^3} - 2\sqrt{27x^3} = 5\sqrt{x^2}\sqrt{3x} - 2\sqrt{9x^2}\sqrt{3x} = 5x\sqrt{3x} - 6x\sqrt{3x} = -x\sqrt{3x}$$

PTS: 2   REF: 061032a2   STA: A2.N.2   TOP: Operations with Radicals

457 ANS:

0.167. $_{10}C_8 \cdot 0.6^8 \cdot 0.4^2 + {}_{10}C_9 \cdot 0.6^9 \cdot 0.4^1 + {}_{10}C_{10} \cdot 0.6^{10} \cdot 0.4^0 \approx 0.167$

PTS: 4   REF: 061036a2   STA: A2.S.15   TOP: Binomial Probability
KEY: at least or at most

458 ANS: 2

$$\frac{2\pi}{b} = \frac{2\pi}{3}$$

PTS: 2   REF: 061111a2   STA: A2.A.69
TOP: Properties of Graphs of Trigonometric Functions   KEY: period

459 ANS:

$\sin(45 + 30) = \sin 45 \cos 30 + \cos 45 \sin 30$

$$= \frac{\sqrt{2}}{2} \cdot \frac{\sqrt{3}}{2} + \frac{\sqrt{2}}{2} \cdot \frac{1}{2} = \frac{\sqrt{6}}{4} + \frac{\sqrt{2}}{4} = \frac{\sqrt{6} + \sqrt{2}}{4}$$

PTS: 4   REF: 061136a2   STA: A2.A.76   TOP: Angle Sum and Difference Identities
KEY: evaluating

460 ANS: 4

$7^2 = 3^2 + 5^2 - 2(3)(5)\cos A$

$49 = 34 - 30\cos A$

$15 = -30\cos A$

$-\frac{1}{2} = \cos A$

$120 = A$

PTS: 2   REF: 081017a2   STA: A2.A.73   TOP: Law of Cosines
KEY: angle, without calculator

461 ANS:

$-3|6-x| < -15$.

$|6-x| > 5$

$6-x > 5$ or $6-x < -5$

$1 > x$ or $11 < x$
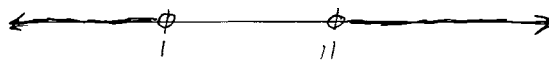
PTS: 2   REF: 061137a2   STA: A2.A.1   TOP: Absolute Value Inequalities
KEY: graph

462 ANS:

$(x+3)^2 + (y-4)^2 = 25$

PTS: 2   REF: fall0929a2   STA: A2.A.49   TOP: Writing Equations of Circles

463 ANS: 1

$13^2 = 15^2 + 14^2 - 2(15)(14)\cos C$

$169 = 421 - 420\cos C$

$-252 = -420\cos C$

$\dfrac{252}{420} = \cos C$

$53 \approx C$

PTS: 2   REF: 061110a2   STA: A2.A.73   TOP: Law of Cosines
KEY: find angle

464 ANS:

$\ln(T - T_0) = -kt + 4.718$. $\ln(T - 68) = -0.104(10) + 4.718$.

$\ln(150 - 68) = -k(3) + 4.718$ $\ln(T - 68) = 3.678$

$4.407 \approx -3k + 4.718$ $T - 68 \approx 39.6$

$k \approx 0.104$ $T \approx 108$

PTS: 6   REF: 011139a2   STA: A2.A.28   TOP: Logarithmic Equations
KEY: advanced

16

465 ANS:

0, 60, 180, 300. $\quad \sin 2\theta = \sin \theta$

$$\sin 2\theta - \sin \theta = 0$$

$$2\sin\theta\cos\theta - \sin\theta = 0$$

$$\sin\theta(2\cos\theta - 1) = 0$$

$$\sin\theta = 0 \quad 2\cos\theta - 1 = 0$$

$$\theta = 0, 180 \quad \cos\theta = \frac{1}{2}$$

$$\theta = 60, 300$$

PTS: 4　　　　REF: 061037a2　　STA: A2.A.68　　TOP: Trigonometric Equations
KEY: double angle identities

466 ANS:

$$\frac{12}{\sin 32} = \frac{10}{\sin B} \qquad\qquad . \; C \approx 180 - (32 + 26.2) \approx 121.8. \; \frac{12}{\sin 32} = \frac{c}{\sin 121.8}$$

$$B = \sin^{-1}\frac{10\sin 32}{12} \approx 26.2 \qquad\qquad c = \frac{12\sin 121.8}{\sin 32} \approx 19.2$$

PTS: 4　　　　REF: 011137a2　　STA: A2.A.73　　TOP: Law of Sines
KEY: basic

467 ANS: 2

$$\frac{10}{\sin 35} = \frac{13}{\sin B} \quad . \quad 35 + 48 < 180$$

$$B \approx 48, 132 \quad 35 + 132 < 180$$

PTS: 2　　　　REF: 011113a2　　STA: A2.A.75　　TOP: Law of Sines - The Ambiguous Case

468 ANS: 2　　　　PTS: 2　　　　REF: 081024a2　　STA: A2.N.8
TOP: Conjugates of Complex Numbers

469 ANS: 2

$$\frac{\dfrac{x}{4} - \dfrac{1}{x}}{\dfrac{1}{2x} + \dfrac{1}{4}} = \frac{\dfrac{x^2-4}{4x}}{\dfrac{2x+4}{8x}} = \frac{(x+2)(x-2)}{4x} \times \frac{8x}{2(x+2)} = x - 2$$

PTS: 2　　　　REF: fall0920a2　　STA: A2.A.17　　TOP: Complex Fractions

470 ANS: 1

$$\sqrt{12^2 - 6^2} = \sqrt{108} = \sqrt{36}\sqrt{3} = 6\sqrt{3}. \; \cot J = \frac{A}{O} = \frac{6}{6\sqrt{3}} \cdot \frac{\sqrt{3}}{\sqrt{3}} = \frac{\sqrt{3}}{3}$$

PTS: 2　　　　REF: 011120a2　　STA: A2.A.55　　TOP: Trigonometric Ratios

471 ANS:

$$\sum_{n=1}^{15} 7n$$

PTS: 2 REF: 081029a2 STA: A2.A.34 TOP: Sigma Notation

472 ANS: 3 PTS: 2 REF: 061127a2 STA: A2.S.6
TOP: Regression

473 ANS: 1

n	3	4	5	Σ
$-r^2 + r$	$-3^2 + 3 = -6$	$-4^2 + 4 = -12$	$-5^2 + 5 = -20$	-38

PTS: 2 REF: 061118a2 STA: A2.N.10 TOP: Sigma Notation
KEY: basic

474 ANS: 1
$${}_5C_3(3x)^2(-2)^3 = 10 \cdot 9x^2 \cdot -8 = -720x^2$$

PTS: 2 REF: fall0919a2 STA: A2.A.36 TOP: Binomial Expansions

475 ANS: 1
common difference is 2. $b_n = x + 2n$

$$10 = x + 2(1)$$
$$8 = x$$

PTS: 2 REF: 081014a2 STA: A2.A.29 TOP: Sequences

476 ANS: 1 PTS: 2 REF: 061025a2 STA: A2.A.34
TOP: Sigma Notation

477 ANS: 2 PTS: 2 REF: 061011a2 STA: A2.A.10
TOP: Fractional Exponents as Radicals

478 ANS: 3
$$f(4) = \frac{1}{2}(4) - 3 = -1. \; g(-1) = 2(-1) + 5 = 3$$

PTS: 2 REF: fall0902a2 STA: A2.A.42 TOP: Compositions of Functions
KEY: numbers

479 ANS: 4
$$6x - x^3 - x^2 = -x(x^2 + x - 6) = -x(x + 3)(x - 2)$$

PTS: 2 REF: fall0917a2 STA: A2.A.7 TOP: Factoring Polynomials
KEY: single variable

480 ANS: 4

$$x^{-\frac{2}{5}} = \frac{1}{x^{\frac{2}{5}}} = \frac{1}{\sqrt[5]{x^2}}$$

PTS: 2   REF: 011118a2   STA: A2.A.10   TOP: Fractional Exponents as Radicals

481 ANS: 4

$$12x^4 + 10x^3 - 12x^2 = 2x^2(6x^2 + 5x - 6) = 2x^2(2x + 3)(3x - 2)$$

PTS: 2   REF: 061008a2   STA: A2.A.7   TOP: Factoring Polynomials
KEY: single variable

482 ANS: 2

$${}_{15}C_8 = 6,435$$

PTS: 2   REF: 081012a2   STA: A2.S.11   TOP: Combinations

483 ANS: 3   PTS: 2   REF: 011110a2   STA: A2.A.30
TOP: Sequences

484 ANS:

101.43, 12.

$$r^2 = 25^2 + 85^2 - 2(25)(85)\cos 125.$$

$$r^2 \approx 10287.7$$

$$r \approx 101.43$$

$$\frac{2.5}{\sin x} = \frac{101.43}{\sin 125}$$

$$x \approx 12$$

PTS: 6   REF: fall0939a2   STA: A2.A.73   TOP: Vectors

485 ANS: 1

$$a_n = -\sqrt{5}(-\sqrt{2})^{n-1}$$

$$a_{15} = -\sqrt{5}(-\sqrt{2})^{15-1} = -\sqrt{5}(-\sqrt{2})^{14} = -\sqrt{5} \cdot 2^7 = -128\sqrt{5}$$

PTS: 2   REF: 061109a2   STA: A2.A.32   TOP: Sequences

486 ANS:

```
3.45*180/π
          197.6704393
Ans▸DMS
       197°40'13.582"
■
```

197°40'. $3.45 \times \dfrac{180}{\pi} \approx 197°40'$.

PTS: 2   REF: fall0931a2   STA: A2.M.2   TOP: Radian Measure
KEY: degrees

487 ANS: 3
(1) and (4) fail the horizontal line test and are not one-to-one. Not every element of the range corresponds to only one element of the domain. (2) fails the vertical line test and is not a function. Not every element of the domain corresponds to only one element of the range.

PTS: 2   REF: 081020a2   STA: A2.A.43   TOP: Defining Functions

488 ANS: 3   PTS: 2   REF: 061007a2   STA: A2.S.9
TOP: Differentiating Permutations and Combinations

489 ANS: 3

$3x + 16 = (x + 2)^2$. −4 is an extraneous solution.

$3x + 16 = x^2 + 4x + 4$

$\quad 0 = x^2 + x - 12$

$\quad 0 = (x + 4)(x - 3)$

$\quad x = -4 \quad x = 3$

PTS: 2   REF: 061121a2   STA: A2.A.22   TOP: Solving Radicals
KEY: extraneous solutions

490 ANS: 1   PTS: 2   REF: 081022a2   STA: A2.A.46
TOP: Transformations with Functions and Relations

491 ANS: 1

$6x - 7 \le 5 \quad 6x - 7 \ge -5$

$\quad 6x \le 12 \qquad 6x \ge 2$

$\quad x \le 2 \qquad\qquad x \ge \dfrac{1}{3}$

PTS: 2   REF: fall0905a2   STA: A2.A.1   TOP: Absolute Value Inequalities
KEY: graph

492 ANS: 3

$\dfrac{-b}{a} = \dfrac{-6}{2} = -3. \quad \dfrac{c}{a} = \dfrac{4}{2} = 2$

PTS: 2   REF: 011121a2   STA: A2.A.21   TOP: Roots of Quadratics
KEY: basic

493 ANS: 3 PTS: 2 REF: 011104a2 STA: A2.A.64
TOP: Using Inverse Trigonometric Functions KEY: unit circle

494 ANS: 1

$$\frac{\sqrt{3}+5}{\sqrt{3}-5}\cdot\frac{\sqrt{3}+5}{\sqrt{3}+5}=\frac{3+5\sqrt{3}+5\sqrt{3}+25}{3-25}=\frac{28+10\sqrt{3}}{-22}=-\frac{14+5\sqrt{3}}{11}$$

PTS: 2 REF: 061012a2 STA: A2.N.5 TOP: Rationalizing Denominators

495 ANS: 3

n	0	1	2	Σ
n^2+2^n	$0^2+2^0=1$	$1^2+2^2=3$	$2^2+2^2=8$	12

$2\times12=24$

PTS: 2 REF: fall0911a2 STA: A2.N.10 TOP: Sigma Notation
KEY: basic

496 ANS: 2
$\cos(-305°+360°)=\cos(55°)$

PTS: 2 REF: 061104a2 STA: A2.A.57 TOP: Reference Angles

497 ANS: 4 PTS: 2 REF: 061112a2 STA: A2.A.39
TOP: Domain and Range KEY: real domain

498 ANS:
Controlled experiment because Howard is comparing the results obtained from an experimental sample against a control sample.

PTS: 2 REF: 081030a2 STA: A2.S.1 TOP: Analysis of Data

499 ANS: 2 PTS: 2 REF: 061021a2 STA: A2.S.8
TOP: Correlation Coefficient

500 ANS: 2
$8^2=64$

PTS: 2 REF: fall0909a2 STA: A2.A.18 TOP: Evaluating Logarithmic Expressions

501 ANS: 2 PTS: 2 REF: 061122a2 STA: A2.A.24
TOP: Completing the Square

502 ANS: 3

$$S=\frac{-b}{a}=\frac{-(-3)}{4}=\frac{3}{4}.\ P=\frac{c}{a}=\frac{-8}{4}=-2$$

PTS: 2 REF: fall0912a2 STA: A2.A.21 TOP: Roots of Quadratics
KEY: basic

503 ANS: 3
$x=5^4=625$

PTS: 2 REF: 061106a2 STA: A2.A.28 TOP: Logarithmic Equations
KEY: basic

504 ANS: 1

$4a + 6 = 4a - 10.$ $4a + 6 = -4a + 10.$ $\left| 4\left(\dfrac{1}{2}\right) + 6 \right| - 4\left(\dfrac{1}{2}\right) = -10$

$6 \neq -10$ $8a = 4$

$8 - 2 \neq -10$

$a = \dfrac{4}{8} = \dfrac{1}{2}$

PTS: 2   REF: 011106a2   STA: A2.A.1   TOP: Absolute Value Equations

505 ANS: 4

Students entering the library are more likely to spend more time studying, creating bias.

PTS: 2   REF: fall0904a2   STA: A2.S.2   TOP: Analysis of Data
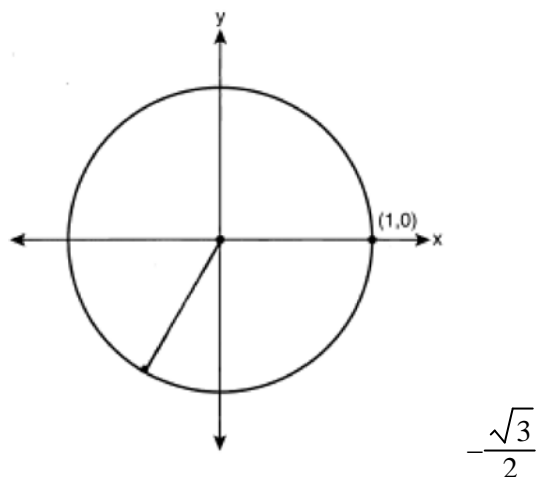
506 ANS: 2

$x^2 + 2 = 6x$

$x^2 - 6x = -2$

$x^2 - 6x + 9 = -2 + 9$

$(x - 3)^2 = 7$

PTS: 2   REF: 011116a2   STA: A2.A.24   TOP: Completing the Square

507 ANS:

$-\dfrac{\sqrt{3}}{2}$

PTS: 2   REF: 061033a2   STA: A2.A.60   TOP: Unit Circle

508 ANS: 3

$$\left(\frac{2}{3}\right)^2 + \cos^2 A = 1 \qquad\qquad \sin 2A = 2\sin A \cos A$$

$$\cos^2 A = \frac{5}{9} \qquad\qquad = 2\left(\frac{2}{3}\right)\left(\frac{\sqrt{5}}{3}\right)$$

$$\cos A = +\frac{\sqrt{5}}{3}, \sin A \text{ is acute.} \qquad = \frac{4\sqrt{5}}{9}$$

PTS: 2   REF: 011107a2   STA: A2.A.77   TOP: Double Angle Identities
KEY: evaluating

509 ANS:

45, 225 $2\tan C - 3 = 3\tan C - 4$

$$1 = \tan C$$

$$\tan^{-1} 1 = C$$

$$C = 45, 225$$

PTS: 2   REF: 081032a2   STA: A2.A.68   TOP: Trigonometric Equations
KEY: basic

510 ANS: 3

$$\text{period} = \frac{2\pi}{b} = \frac{2\pi}{3\pi} = \frac{2}{3}$$

PTS: 2   REF: 081026a2   STA: A2.A.70   TOP: Graphing Trigonometric Functions
KEY: recognize

511 ANS:

39,916,800. $\dfrac{_{12}P_{12}}{3! \cdot 2!} = \dfrac{479,001,600}{12} = 39,916,800$
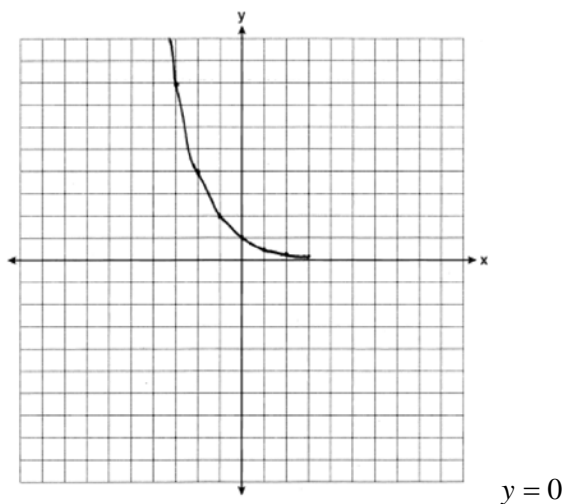
PTS: 2   REF: 081035a2   STA: A2.S.10   TOP: Permutations

512 ANS: 2

$$\left(\frac{w^{-5}}{w^{-9}}\right)^{\frac{1}{2}} = (w^4)^{\frac{1}{2}} = w^2$$

PTS: 2   REF: 081011a2   STA: A2.A.8   TOP: Negative and Fractional Exponents

23

513 ANS:

$y = 0$

PTS: 2   REF: 061031a2   STA: A2.A.53   TOP: Graphing Exponential Functions
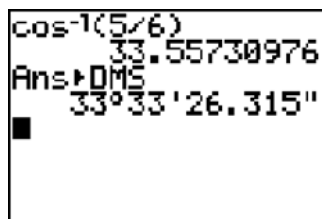
514 ANS:

230. $10 + (1^3 - 1) + (2^3 - 1) + (3^3 - 1) + (4^3 - 1) + (5^3 - 1) = 10 + 0 + 7 + 26 + 63 + 124 = 230$

PTS: 2   REF: 011131a2   STA: A2.N.10   TOP: Sigma Notation
KEY: basic

515 ANS: 1

$\cos K = \dfrac{5}{6}$

$K = \cos^{-1} \dfrac{5}{6}$

$K \approx 33°33'$

PTS: 2   REF: 061023a2   STA: A2.A.55   TOP: Trigonometric Ratios

516 ANS:

$y = 2.001x^{2.298}$, 1,009. $y = 2.001(15)^{2.298} \approx 1009$

PTS: 4   REF: fall0938a2   STA: A2.S.7   TOP: Power Regression

517 ANS: 3

$68\% \times 50 = 34$

PTS: 2   REF: 081013a2   STA: A2.S.5   TOP: Normal Distributions
KEY: predict

518 ANS: 4   PTS: 2   REF: 061026a2   STA: A2.A.29
TOP: Sequences

519 ANS: 3
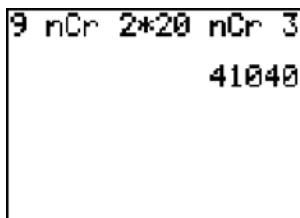$$\sqrt{-300} = \sqrt{100}\sqrt{-1}\sqrt{3}$$

PTS: 2 REF: 061006a2 STA: A2.N.6 TOP: Square Roots of Negative Numbers

520 ANS:


```
9 nCr 2*20 nCr 3
              41040
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41,040.

PTS: 2 REF: fall0935a2 STA: A2.S.12 TOP: Sample Space

521 ANS:
$$x^2 - 6x - 27 = 0, \ \frac{-b}{a} = 6. \ \frac{c}{a} = -27. \ \text{If } a = 1 \text{ then } b = -6 \text{ and } c = -27$$

PTS: 4 REF: 061130a2 STA: A2.A.21 TOP: Roots of Quadratics
KEY: basic

522 ANS: 4
$$b^2 - 4ac = 3^2 - 4(9)(-4) = 9 + 144 = 153$$

PTS: 2 REF: 081016a2 STA: A2.A.2 TOP: Using the Discriminant
KEY: determine nature of roots given equation

523 ANS:
$$e^{3\ln 2} = e^{\ln 2^3} = e^{\ln 8} = 8$$

PTS: 2 REF: 061131a2 STA: A2.A.12 TOP: Evaluating Exponential Expressions

524 ANS:

$$y = x^2 - 6. \ f^{-1}(x) \text{ is not a function.}$$

$$x = y^2 - 6$$

$$x + 6 = y^2$$

$$\pm\sqrt{x + 6} = y$$

PTS: 2 REF: 061132a2 STA: A2.A.44 TOP: Inverse of Functions
KEY: equations

525 ANS:
$$12 \cdot 6 = 9w$$

$$8 = w$$

PTS: 2 REF: 011130a2 STA: A2.A.5 TOP: Inverse Variation

526 ANS: 4 PTS: 2 REF: 061101a2 STA: A2.S.1
TOP: Analysis of Data

527 ANS:

No. TENNESSEE: $\dfrac{_9P_9}{4!\cdot 2!\cdot 2!} = \dfrac{362,880}{96} = 3,780$. VERMONT: $_7P_7 = 5,040$

PTS: 4   REF: 061038a2   STA: A2.S.10   TOP: Permutations

528 ANS:

7. $f(-3) = (-3)^2 - 6 = 3$. $g(x) = 2^3 - 1 = 7$.

PTS: 2   REF: 061135a2   STA: A2.A.42   TOP: Compositions of Functions
KEY: numbers

529 ANS: 3

$$\frac{\sin^2\theta + \cos^2\theta}{1 - \sin^2\theta} = \frac{1}{\cos^2\theta} = \sec^2\theta$$

PTS: 2   REF: 061123a2   STA: A2.A.58   TOP: Reciprocal Trigonometric Relationships

530 ANS: 3

$$\frac{3}{\sqrt{3a^2b}} = \frac{3}{a\sqrt{3b}} \cdot \frac{\sqrt{3b}}{\sqrt{3b}} = \frac{3\sqrt{3b}}{3ab} = \frac{\sqrt{3b}}{ab}$$
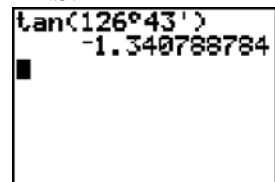
PTS: 2   REF: 081019a2   STA: A2.A.15   TOP: Rationalizing Denominators
KEY: index = 2

531 ANS: 4
$s = \theta r = 2 \cdot 4 = 8$

PTS: 2   REF: fall0922a2   STA: A2.A.61   TOP: Arc Length
KEY: arc length

532 ANS: 2

PTS: 2   REF: 061115a2   STA: A2.A.66   TOP: Determining Trigonometric Functions

533 ANS: 4
$$\frac{2\pi}{b} = \frac{2\pi}{\frac{1}{3}} = 6\pi$$

PTS: 2   REF: 061027a2   STA: A2.A.69
TOP: Properties of Graphs of Trigonometric Functions   KEY: period

534 ANS:

$$\frac{\sqrt{108x^5y^8}}{\sqrt{6xy^5}} = \sqrt{18x^4y^3} = 3x^2y\sqrt{2y}$$

PTS: 2 REF: 011133a2 STA: A2.A.14 TOP: Operations with Radicals
KEY: with variables | index = 2

535 ANS:
$-3, -5, -8, -12$

PTS: 2 REF: fall0934a2 STA: A2.A.33 TOP: Recursive Sequences

536 ANS:
$12t^8 - 75t^4 = 3t^4(4t^4 - 25) = 3t^4(2t^2 + 5)(2t^2 - 5)$

PTS: 2 REF: 061133a2 STA: A2.A.7
TOP: Factoring the Difference of Perfect Squares KEY: binomial

537 ANS: 4
$(3 + \sqrt{5})(3 - \sqrt{5}) = 9 - \sqrt{25} = 4$

PTS: 2 REF: 081001a2 STA: A2.N.4 TOP: Operations with Irrational Expressions
KEY: without variables | index = 2

538 ANS: 1
$y \ge x^2 - x - 6$

$y \ge (x - 3)(x + 2)$

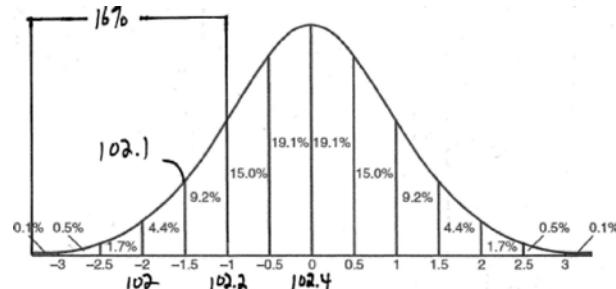PTS: 2 REF: 061017a2 STA: A2.A.4 TOP: Quadratic Inequalities
KEY: two variables

539 ANS:
$2.5 \cdot \dfrac{180}{\pi} \approx 143.2°$

PTS: 2 REF: 011129a2 STA: A2.M.2 TOP: Radian Measure
KEY: degrees

540 ANS: 1

PTS: 2 REF: fall0915a2 STA: A2.S.5 TOP: Normal Distributions
KEY: interval

541 ANS:

$y = 10.596(1.586)^x$

PTS: 2   REF: 081031a2   STA: A2.S.7   TOP: Exponential Regression

542 ANS: 1

$2i^2 + 3i^3 = 2(-1) + 3(-i) = -2 - 3i$

PTS: 2   REF: 081004a2   STA: A2.N.7   TOP: Imaginary Numbers

543 ANS:

$32x^5 - 80x^4 + 80x^3 - 40x^2 + 10x - 1.$ $_5C_0(2x)^5(-1)^0 = 32x^5.$ $_5C_1(2x)^4(-1)^1 = -80x^4.$ $_5C_2(2x)^3(-1)^2 = 80x^3.$
$_5C_3(2x)^2(-1)^3 = -40x^2.$ $_5C_4(2x)^1(-1)^4 = 10x.$ $_5C_5(2x)^0(-1)^5 = -1$

PTS: 4   REF: 011136a2   STA: A2.A.36   TOP: Binomial Expansions

544 ANS: 4   PTS: 2   REF: fall0925a2   STA: A2.S.10
     TOP: Permutations

545 ANS: 1

$2\log x - (3\log y + \log z) = \log x^2 - \log y^3 - \log z = \log \dfrac{x^2}{y^3 z}$

PTS: 2   REF: 061010a2   STA: A2.A.19   TOP: Properties of Logarithms

546 ANS: 1

$8 \times 8 \times 7 \times 1 = 448.$ The first digit cannot be 0 or 5. The second digit cannot be 5 or the same as the first digit.
The third digit cannot be 5 or the same as the first or second digit.

PTS: 2   REF: 011125a2   STA: A2.S.10   TOP: Permutations