JEFFERSON MATH PROJECT
REGENTS BY TYPE

The NY Algebra 2/Trigonometry Regents Exams
## Fall 2009-June 2011

www.jmap.org

Dear Sir

I have to acknolege the reciept of your favor of May 14. in which you mention that you have finished the 6. first books of Euclid, plane trigonometry, surveying & algebra and ask whether I think a further pursuit of that branch of science would be useful to you. there are some propositions in the latter books of Euclid, & some of Archimedes, which are useful, & I have no doubt you have been made acquainted with them. trigonometry, so far as this, is most valuable to every man, there is scarcely a day in which he will not resort to it for some of the purposes of common life. the science of calculation also is indispensible as far as the extraction of the square & cube roots; Algebra as far as the quadratic equation & the use of logarithms are often of value in ordinary cases: but all beyond these is but a luxury; a delicious luxury indeed; but not to be indulged in by one who is to have a profession to follow for his subsistence. in this light I view the conic sections, curves of the higher orders, perhaps even spherical trigonometry, Algebraical operations beyond the 2d dimension, and fluxions.
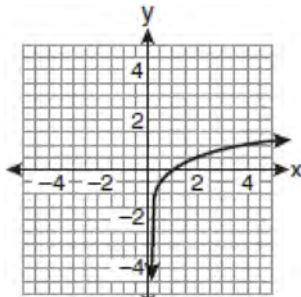
Letter from Thomas Jefferson to William G. Munford, Monticello, June 18, 1799.

Algebra 2/Trigonometry Multiple Choice Regents Exam Questions
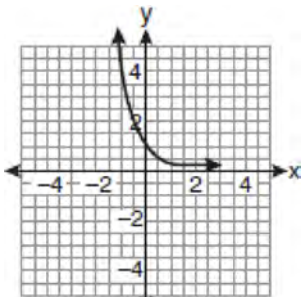
1 If a function is defined by the equation $f(x) = 4^x$, which graph represents the inverse of this function?
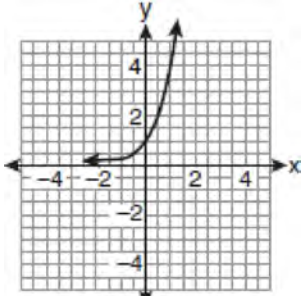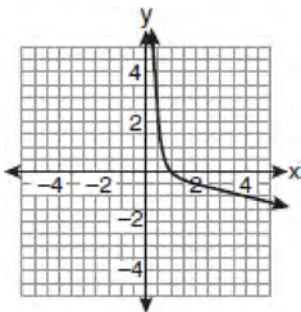

1)

2)

3)

4)

2 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) $\dfrac{4}{3}$

3 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

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

5 The expression $\log_5\left(\dfrac{1}{25}\right)$ is equivalent to
1) $\dfrac{1}{2}$
2) 2
3) $-\dfrac{1}{2}$
4) -2

1

6 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) $f(x) = \log_2 x$

7 The expression $\sqrt[4]{16x^2 y^7}$ is equivalent to

1) $2x^{\frac{1}{2}} y^{\frac{7}{4}}$
2) $2x^8 y^{28}$
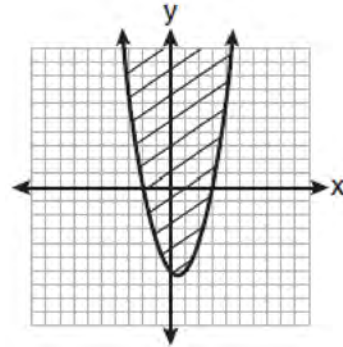3) $4x^{\frac{1}{2}} y^{\frac{7}{4}}$
4) $4x^8 y^{28}$

8 In $\triangle ABC$, $m\angle A = 120$, $b = 10$, and $c = 18$. What is the area of $\triangle ABC$ to the *nearest square inch*?
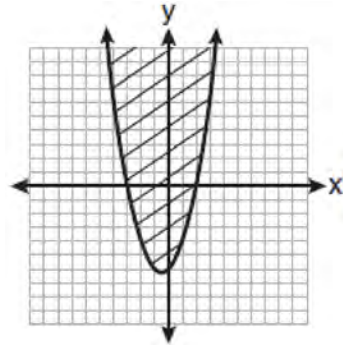
1) 52
2) 78
3) 90
4) 156

9 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) $(x+1)^2 + (y+3)^2 = 7$
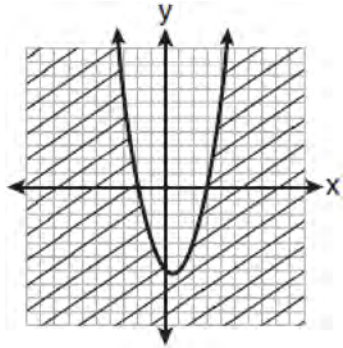4) $(x+1)^2 + (y+3)^2 = 10$

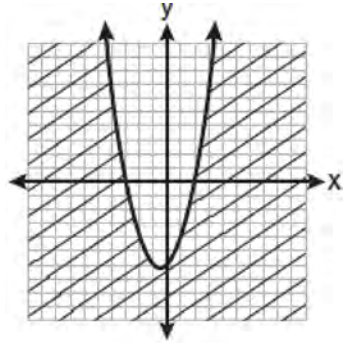10 Which graph best represents the inequality $y + 6 \geq x^2 - x$?

1)

2)

3)

4)

2

11 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

12 The expression $4ab\sqrt{2b} - 3a\sqrt{18b^3} + 7ab\sqrt{6b}$ is equivalent to
1) $2ab\sqrt{6b}$
2) $16ab\sqrt{2b}$
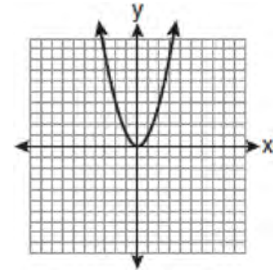3) $-5ab + 7ab\sqrt{6b}$
4) $-5ab\sqrt{2b} + 7ab\sqrt{6b}$

13 The expression $\cos 4x \cos 3x + \sin 4x \sin 3x$ is equivalent to
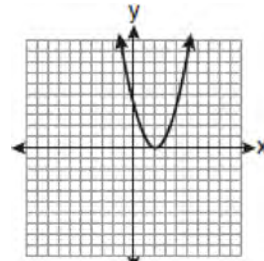1) $\sin x$
2) $\sin 7x$
3) $\cos x$
4) $\cos 7x$

14 What is the radian measure of an angle whose measure is $-420°$?
1) $-\dfrac{7\pi}{3}$
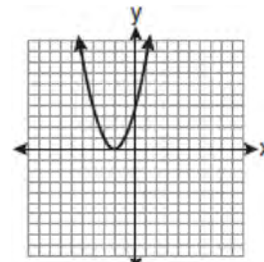2) $-\dfrac{7\pi}{6}$
3) $\dfrac{7\pi}{6}$
4) $\dfrac{7\pi}{3}$

Which graph represents the function $f(x + 2)$?

1)

2)

3)

4)

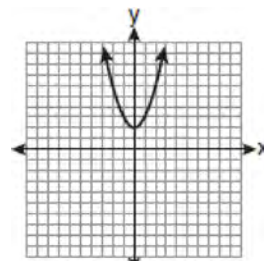15 The graph below shows the function $f(x)$.
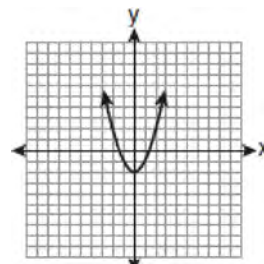
3

16 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

17 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) $\dfrac{8!}{2!\cdot 2!}$

18 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

19 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) $\dfrac{17+5\sqrt{3}}{14}$

20 The value of the expression $2\sum_{n=0}^{2}(n^2+2^n)$ is
1) 12
2) 22
3) 24
4) 26

21 In the diagram below of right triangle KTW, $KW = 6$, $KT = 5$, and m$\angle KTW = 90$.
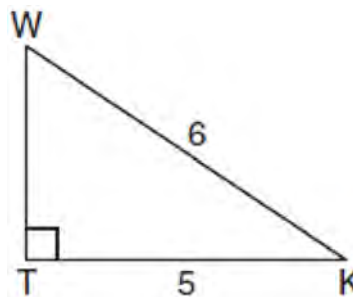
What is the measure of $\angle K$, to the *nearest minute*?
1) 33°33'
2) 33°34'
3) 33°55'
4) 33°56'

22 If $\angle A$ is acute and $\tan A = \frac{2}{3}$, then

1) $\cot A = \frac{2}{3}$

2) $\cot A = \frac{1}{3}$

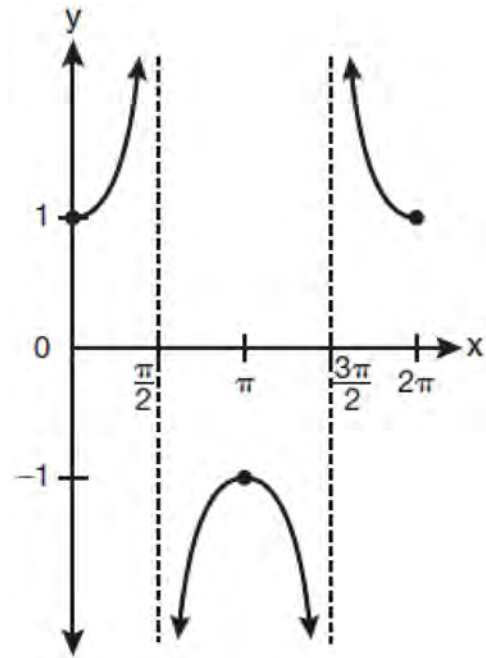3) $\cot(90° - A) = \frac{2}{3}$

4) $\cot(90° - A) = \frac{1}{3}$

23 If $f(x) = \frac{x}{x^2 - 16}$, what is the value of $f(-10)$?

1) $-\frac{5}{2}$

2) $-\frac{5}{42}$

3) $\frac{5}{58}$

4) $\frac{5}{18}$

24 Expressed as a function of a positive acute angle, $\cos(-305°)$ is equal to

1) $-\cos 55°$
2) $\cos 55°$
3) $-\sin 55°$
4) $\sin 55°$

25 Which equation is represented by the graph below?

1) $y = \cot x$
2) $y = \csc x$
3) $y = \sec x$
4) $y = \tan x$

26 The solution set of the equation $\sqrt{x+3} = 3 - x$ is
1) $\{1\}$
2) $\{0\}$
3) $\{1,6\}$
4) $\{2,3\}$

27 The expression $(3 - 7i)^2$ is equivalent to
1) $-40 + 0i$
2) $-40 - 42i$
3) $58 + 0i$
4) $58 - 42i$

28 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) $b_n = 10(2)^{n-1}$

29 What is the period of the function

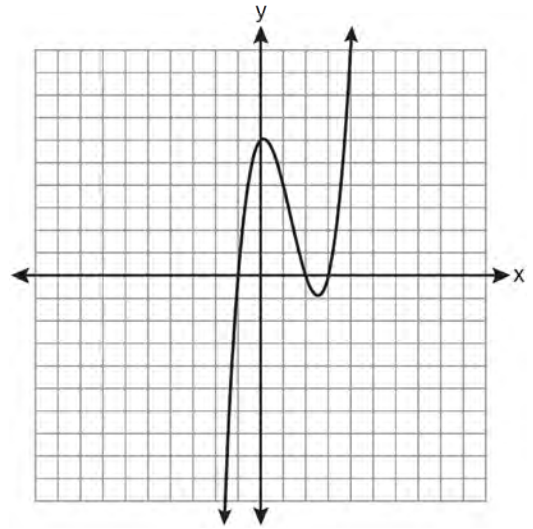$$y = \frac{1}{2}\sin\left(\frac{x}{3} - \pi\right)?$$

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

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

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

4) 6π

30 The fraction $\dfrac{3}{\sqrt{3a^2b}}$ is equivalent to

1) $\dfrac{1}{a\sqrt{b}}$

2) $\dfrac{\sqrt{b}}{ab}$

3) $\dfrac{\sqrt{3b}}{ab}$

4) $\dfrac{\sqrt{3}}{a}$

31 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

32 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) $-\dfrac{4\sqrt{5}}{9}$

33 Which relation is *not* a function?
1) $(x-2)^2 + y^2 = 4$
2) $x^2 + 4x + y = 4$
3) $x + y = 4$
4) $xy = 4$

34 The expression $\log_8 64$ is equivalent to
1) 8
2) 2
3) $\dfrac{1}{2}$
4) $\dfrac{1}{8}$

35 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

36 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) $4x^2 + 3x - 2 = 0$

37 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)

7
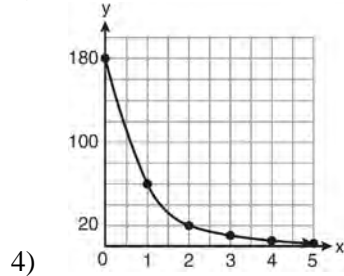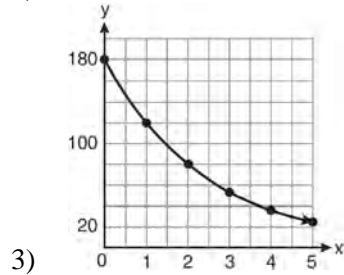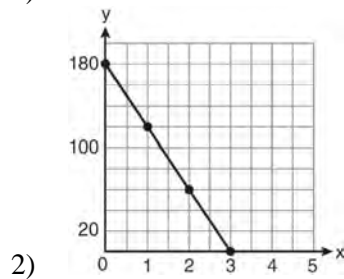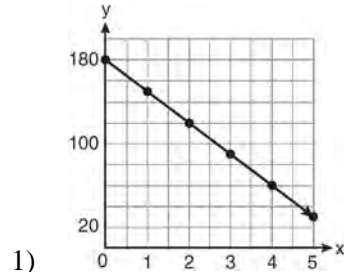
38 Which graph represents one complete cycle of the equation $y = \sin 3\pi x$?

1)

2)

3)

4)
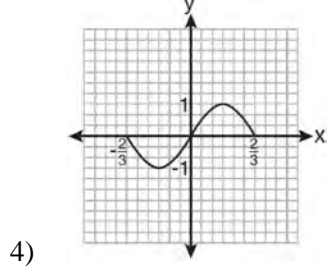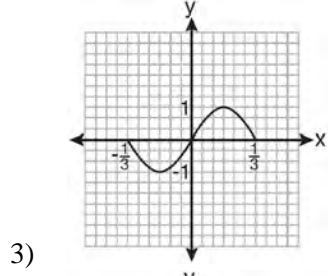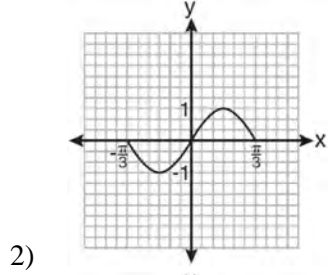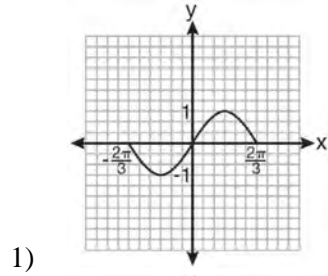
39 Which graph represents a one-to-one function?

1)

2)

3)

4)
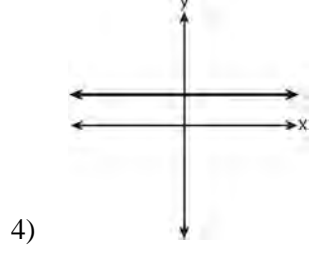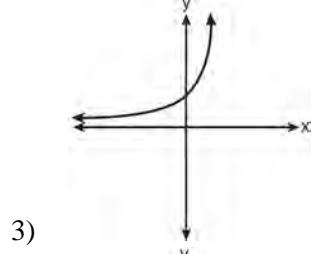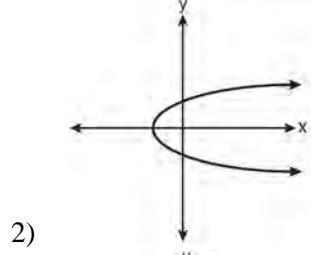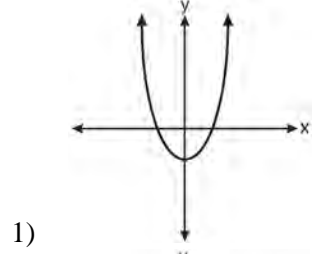
40 Which graph does *not* represent a function?

1)

2)

3)

4)
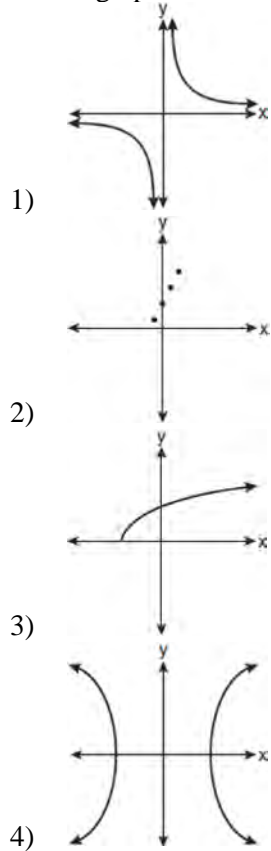
41 The roots of the equation $9x^2 + 3x - 4 = 0$ are
1) imaginary
2) real, rational, and equal
3) real, rational, and unequal
4) real, irrational, and unequal

42 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) $_{20}P_3$

43 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}

44 The solution set of $\sqrt{3x + 16} = x + 2$ is
1) $\{-3, 4\}$
2) $\{-4, 3\}$
3) $\{3\}$
4) $\{-4\}$

9

45 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.
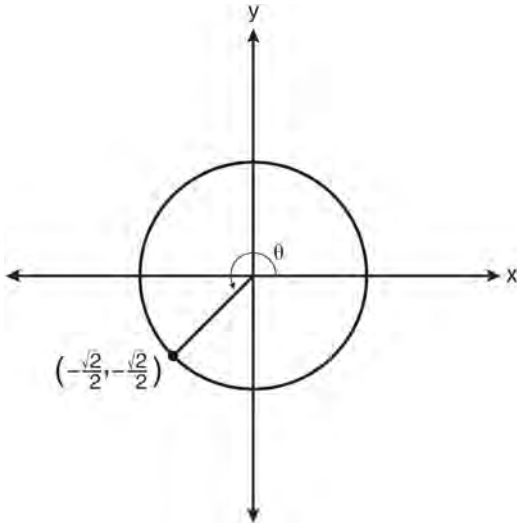
What is $m\angle\theta$?
1) 45
2) 135
3) 225
4) 240

46 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) $2x^2 - 6x + 4 = 0$

47 In simplest form, $\sqrt{-300}$ is equivalent to
1) $3i\sqrt{10}$
2) $5i\sqrt{12}$
3) $10i\sqrt{3}$
4) $12i\sqrt{5}$

48 Samantha constructs the scatter plot below from a set of data.
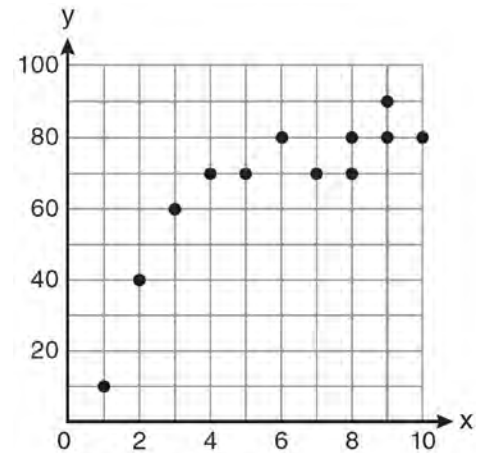
Based on her scatter plot, which regression model would be most appropriate?
1) exponential
2) linear
3) logarithmic
4) power

49 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) $-\cos^2\theta - 1$

50 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) $\dfrac{2}{3}\log A + \dfrac{1}{3}\log B - \dfrac{1}{3}\log C$

51 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 $\dfrac{2\pi}{3}$.

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) $\dfrac{1}{6}$

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

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

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

52 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.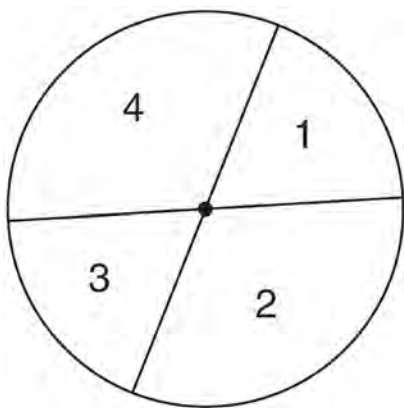 The data showed that the mean number of hours that students spend studying was 15.7 per week. Which characteristic of the survey could create a bias in the results?

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

53 Which equation represents the circle shown in the graph below that passes through the point $(0,-1)$?
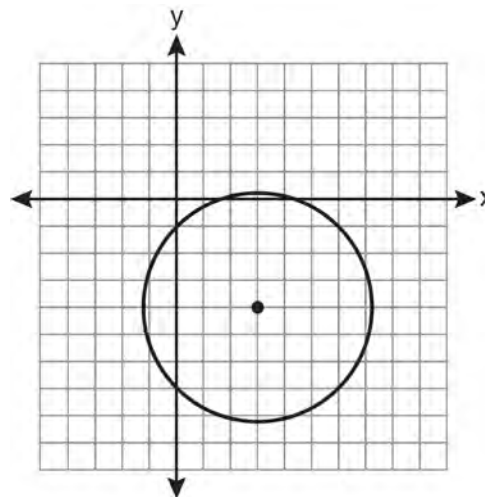
1) $(x - 3)^2 + (y + 4)^2 = 16$

2) $(x - 3)^2 + (y + 4)^2 = 18$

3) $(x + 3)^2 + (y - 4)^2 = 16$

4) $(x + 3)^2 + (y - 4)^2 = 18$

54 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

55 The value of the expression $\sum_{r=3}^{5}(-r^2 + r)$ is
1) -38
2) -12
3) 26
4) 62

56 What is the fifteenth term of the sequence $5, -10, 20, -40, 80, \ldots$?
1) $-163,840$
2) $-81,920$
3) $81,920$
4) $327,680$

57 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) $\dfrac{1}{\sqrt[5]{x^2}}$

58 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) $(-6, -3)$
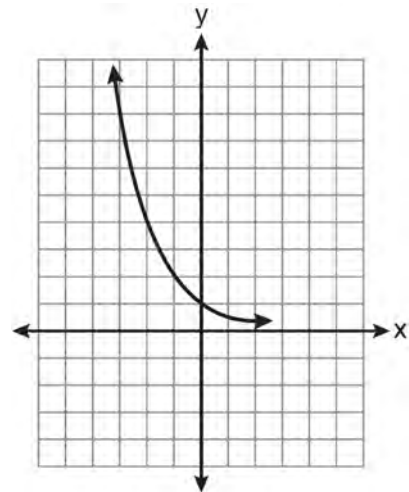
59 Which values of x are in the solution set of the following system of equations?
$$y = 3x - 6$$
$$y = x^2 - x - 6$$
1) $0, -4$
2) $0, 4$
3) $6, -2$
4) $-6, 2$

60 Which equation is represented by the graph below?

1) $y = 5^x$
2) $y = 0.5^x$
3) $y = 5^{-x}$
4) $y = 0.5^{-x}$

61 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

62 The product of i^7 and i^5 is equivalent to
1) 1
2) -1
3) i
4) $-i$

63 The conjugate of $7 - 5i$ is
1) $-7 - 5i$
2) $-7 + 5i$
3) $7 - 5i$
4) $7 + 5i$

64 What is the value of x in the equation $\log_5 x = 4$?
1) 1.16
2) 20
3) 625
4) 1,024

65 The expression $2i^2 + 3i^3$ is equivalent to
1) $-2 - 3i$
2) $2 - 3i$
3) $-2 + 3i$
4) $2 + 3i$

66 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) $\{n + 4, n + 16, n + 64, n + 256, \dots\}$

67 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) $\cos A = \dfrac{8}{5}$

68 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

69 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

13

70 What is the radian measure of the smaller angle formed by the hands of a clock at 7 o'clock?

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

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

3) $\frac{5\pi}{6}$

4) $\frac{7\pi}{6}$

74 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) $x^2 - x - 3$

71 What is the range of $f(x) = (x+4)^2 + 7$?
1) $y \geq -4$
2) $y \geq 4$
3) $y = 7$
4) $y \geq 7$

75 What is the common difference of the arithmetic sequence $5, 8, 11, 14$?

1) $\frac{8}{5}$

2) -3

3) 3

4) 9

72 What is the common ratio of the geometric sequence whose first term is 27 and fourth term is 64?

1) $\frac{3}{4}$

2) $\frac{64}{81}$

3) $\frac{4}{3}$

4) $\frac{37}{3}$

76 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) $a^{-2} b^{-1}$

73 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) $\{x \mid x < -5 \text{ or } x > 2\}$

77 What is the number of degrees in an angle whose radian measure is $\dfrac{11\pi}{12}$?

1) 150
2) 165
3) 330
4) 518

78 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) $17 = \dfrac{446 + 16x}{26 + x}$

79 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) $2x^2(2x + 3)(3x - 2)$

80 Which graph represents the equation $y = \cos^{-1} x$?
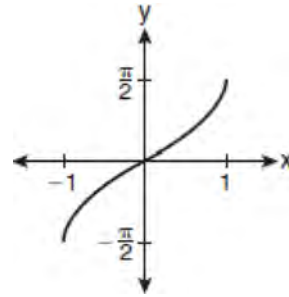
1)

2)

3)

4)

15

81 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) $\dfrac{8}{9}$

82 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
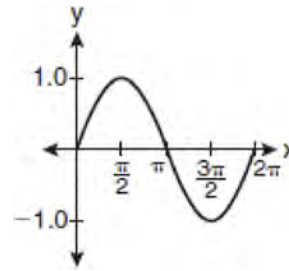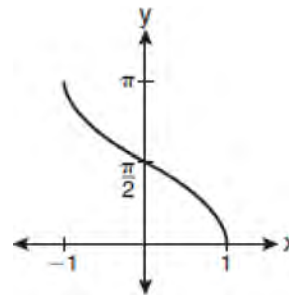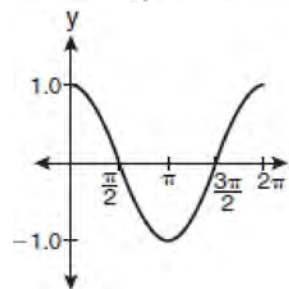
1) below the 16th percentile
2) between the 50th and 84th percentiles
3) between the 16th and 50th percentiles
4) above the 84th percentile

83 The solution set of $4^{x^2 + 4x} = 2^{-6}$ is

1) $\{1,3\}$
2) $\{-1,3\}$
3) $\{-1,-3\}$
4) $\{1,-3\}$

84 What is the domain of the function $f(x) = \sqrt{x - 2} + 3$?

1) $(-\infty, \infty)$
2) $(2, \infty)$
3) $[2, \infty)$
4) $[3, \infty)$

85 If $f(x) = \dfrac{1}{2}x - 3$ and $g(x) = 2x + 5$, what is the value of $(g \circ f)(4)$?

1) -13
2) 3.5
3) 3
4) 6

86 What is the conjugate of $-2 + 3i$?

1) $-3 + 2i$
2) $-2 - 3i$
3) $2 - 3i$
4) $3 + 2i$

87 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 $f(x)$?
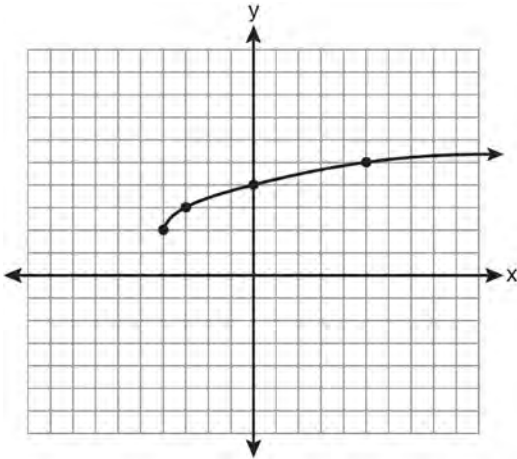
1) $\{x \mid 0 \le x \le \pi\}$
2) $\{x \mid 0 \le x \le 2\pi\}$
3) $\left\{x \mid -\dfrac{\pi}{2} < x < \dfrac{\pi}{2}\right\}$
4) $\left\{x \mid -\dfrac{\pi}{2} < x < \dfrac{3\pi}{2}\right\}$

88 What is the solution set of the equation $|4a + 6| - 4a = -10$?

1) $\varnothing$
2) $\{0\}$
3) $\left\{\dfrac{1}{2}\right\}$
4) $\left\{0, \dfrac{1}{2}\right\}$

16

89 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) $\{x \mid x \geq 2\}; \{y \mid y \geq -4\}$

90 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) $\log \dfrac{2xz}{3y}$

91 Written in simplest form, the expression $\dfrac{\frac{x}{4} - \frac{1}{x}}{\frac{1}{2x} + \frac{1}{4}}$ is equivalent to

1) $x - 1$
2) $x - 2$

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

4) $\dfrac{x^2 - 4}{x + 2}$

92 What is the solution of the equation $2\log_4(5x) = 3$?

1) 6.4
2) 2.56

3) $\dfrac{9}{5}$

4) $\dfrac{8}{5}$

93 In $\triangle ABC$, $a = 3$, $b = 5$, and $c = 7$. What is $m\angle C$?

1) 22
2) 38
3) 60
4) 120

94 What is the principal value of $\cos^{-1}\left(-\dfrac{\sqrt{3}}{2}\right)$?

1) $-30°$
2) $60°$
3) $150°$
4) $240°$

17

95 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) $\dfrac{4(5+\sqrt{13})}{38}$

96 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

97 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

98 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) $x^2 + 6x - 5$

99 Which graph represents a relation that is *not* a function?

1)

2)

3)

4)

18
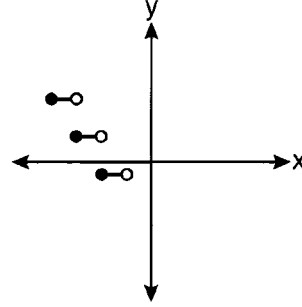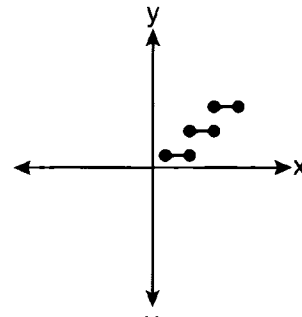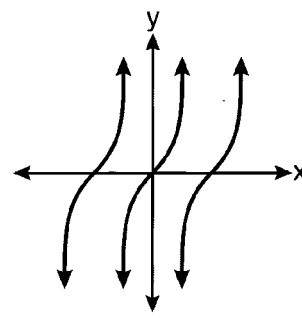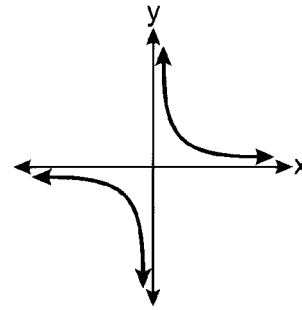
100 Which graph shows $y = \cos^{-1} x$?
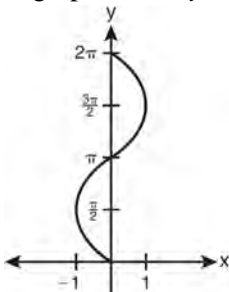
1)
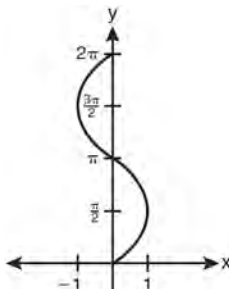
2)
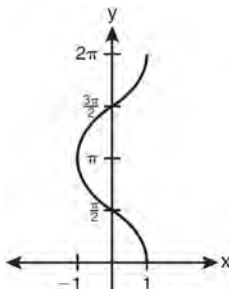
3)
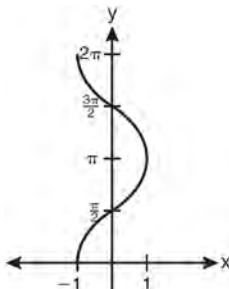
4)

101 What is the coefficient of the fourth term in the expansion of $(a - 4b)^9$?
1) $-5,376$
2) -336
3) 336
4) $5,376$
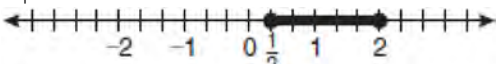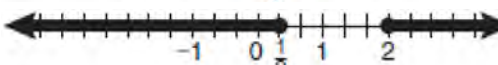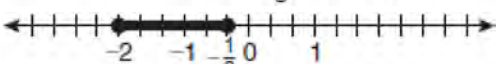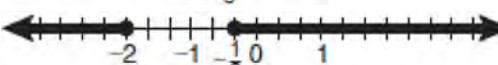
102 The product of $(3 + \sqrt{5})$ and $(3 - \sqrt{5})$ is
1) $4 - 6\sqrt{5}$
2) $14 - 6\sqrt{5}$
3) 14
4) 4

103 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) $\dfrac{{}_{15}P_2 \cdot {}_5P_1}{{}_{30}P_3}$

104 Which graph represents the solution set of $|6x - 7| \le 5$?

1)

2)

3)

4)

105 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
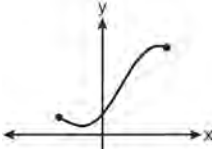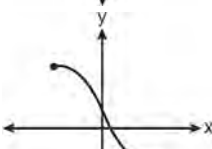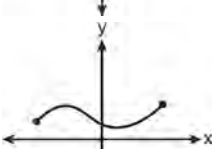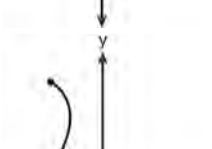
106 The value of $\tan 126°43'$ to the *nearest ten-thousandth* is

1) -1.3407
2) -1.3408
3) -1.3548
4) -1.3549

107 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) $\dfrac{7 \pm \sqrt{73}}{4}$

108 Which graph does *not* represent a function?

1)

2)

3)

4)

109 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) $\csc^2 \theta$

110 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

111 When $x^{-1} - 1$ is divided by $x - 1$, the quotient is

1) -1

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

3) $\dfrac{1}{x^2}$

4) $\dfrac{1}{(x-1)^2}$

112 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) $2\sqrt{x + 2}$

113 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*?
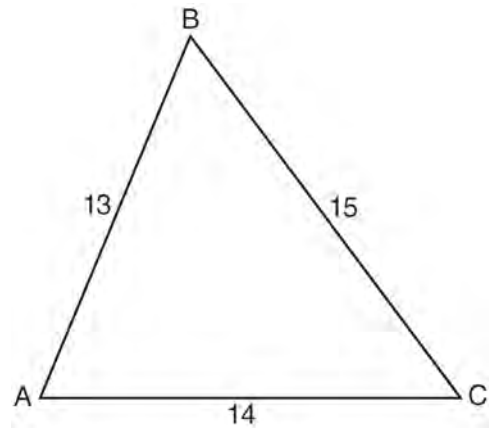
1) 53

2) 59

3) 67

4) 127

114 Which equation is sketched in the diagram below?
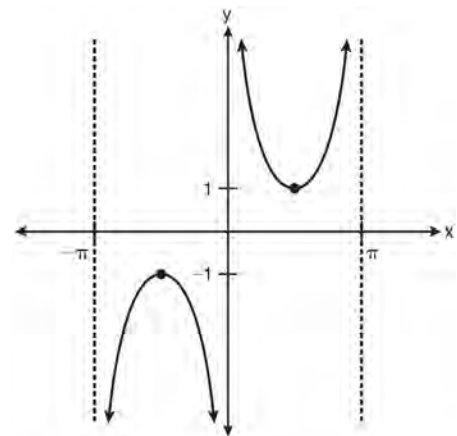
1) $y = \csc x$

2) $y = \sec x$

3) $y = \cot x$

4) $y = \tan x$

115 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) $f(\theta) = 2\sin\theta + 3$

116 The graph of $y = f(x)$ is shown below.
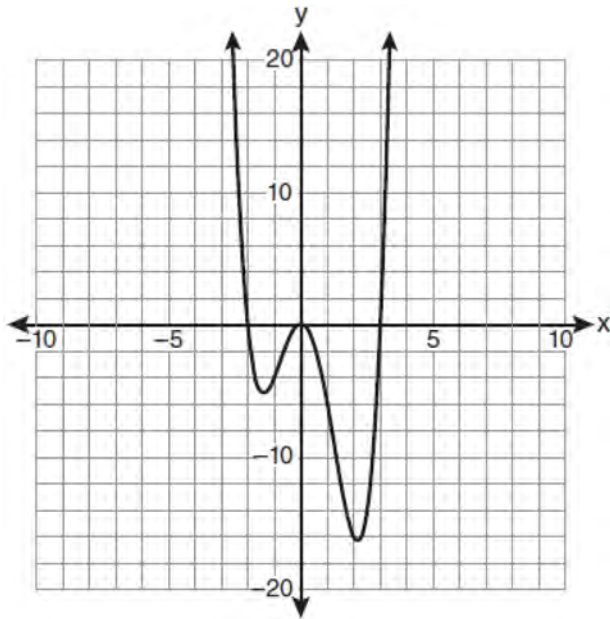
Which set lists all the real solutions of $f(x) = 0$?
1) $\{-3, 2\}$
2) $\{-2, 3\}$
3) $\{-3, 0, 2\}$
4) $\{-2, 0, 3\}$

117 What is the formula for the nth term of the sequence $54, 18, 6, \ldots$?
1) $a_n = 6\left(\frac{1}{3}\right)^n$
2) $a_n = 6\left(\frac{1}{3}\right)^{n-1}$
3) $a_n = 54\left(\frac{1}{3}\right)^n$
4) $a_n = 54\left(\frac{1}{3}\right)^{n-1}$

118 The value of x in the equation $4^{2x+5} = 8^{3x}$ is
1) 1
2) 2
3) 5
4) -10

119 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

120 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) $\{(0,1),(1,0),(2,0),(3,2)\}$

121 What is the fifteenth term of the geometric sequence $-\sqrt{5}, \sqrt{10}, -2\sqrt{5}, \ldots$?
1) $-128\sqrt{5}$
2) $128\sqrt{10}$
3) $-16384\sqrt{5}$
4) $16384\sqrt{10}$

122 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) $\dfrac{1}{\sqrt{(x^2 - 1)^3}}$

123 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.

124 In which graph is θ coterminal with an angle of $-70°$?

1)

2)

3)

4)
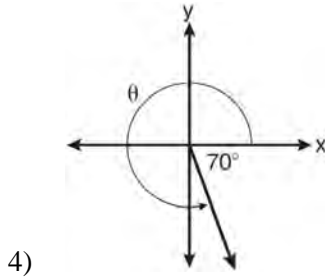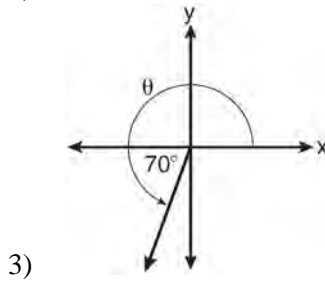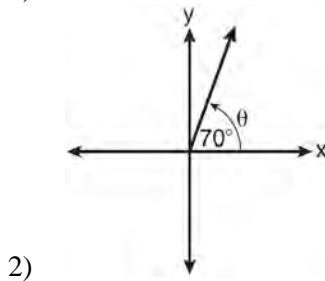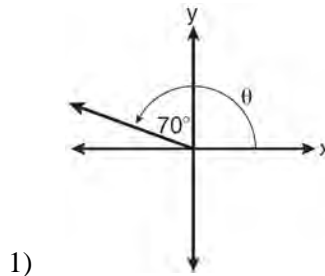
125 What is the fourth term in the expansion of $(3x - 2)^5$?
1) $-720x^2$
2) $-240x$
3) $720x^2$
4) $1,080x^3$

126 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) $(x-6)^2 = 34$

127 In the diagram below of right triangle JTM, $JT = 12$, $JM = 6$, and m$\angle JMT = 90$.
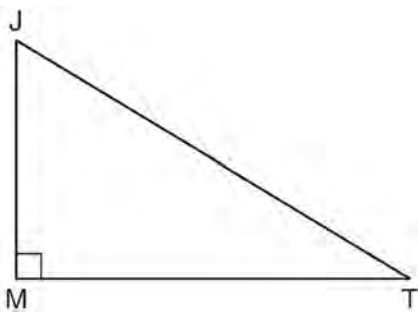
What is the value of $\cot J$?

1) $\dfrac{\sqrt{3}}{3}$
2) 2
3) $\sqrt{3}$
4) $\dfrac{2\sqrt{3}}{3}$

128 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) $60°, 120°, 240°, 300°$

129 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) $\dfrac{3 \pm 3\sqrt{5}}{2}$

130 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 $g(x) = -\dfrac{1}{2}x + 4$

131 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

24

132 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) $\displaystyle\sum_{k=1}^{20}(2k-1)$

2) $\displaystyle\sum_{k=2}^{40}(k-1)$

3) $\displaystyle\sum_{k=-1}^{37}(k+2)$

4) $\displaystyle\sum_{k=1}^{39}(2k-1)$

133 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) $0,-1,-2$

134 Which ratio represents $\csc A$ in the diagram below?
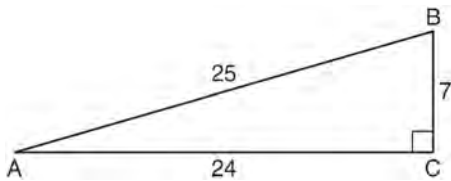
1) $\dfrac{25}{24}$

2) $\dfrac{25}{7}$

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

4) $\dfrac{7}{24}$

135 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 2 Point Regents Exam Questions

1   A circle shown in the diagram below has a center of $(-5,3)$ and passes through point $(-1,7)$.
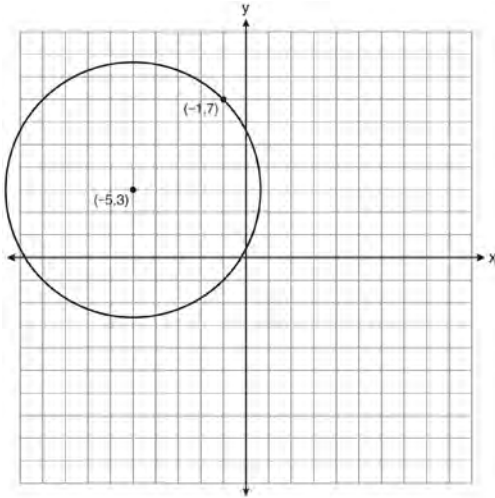
Write an equation that represents the circle.

2   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*.

3   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.

4   Write an equation of the circle shown in the graph below.
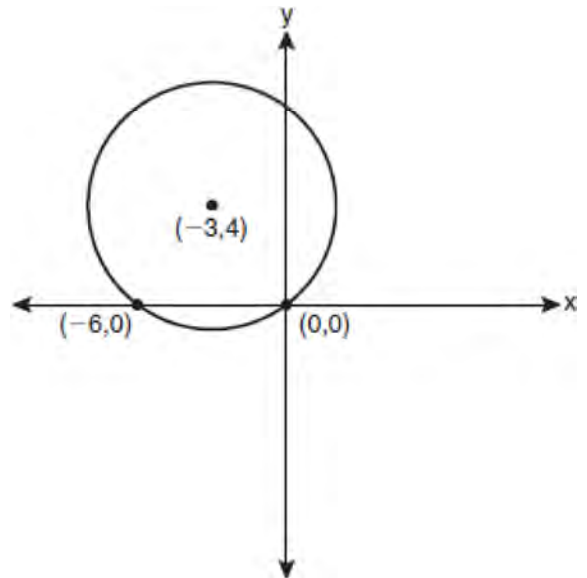
5   Simplify the expression $\dfrac{3x^{-4}y^5}{(2x^3y^{-7})^{-2}}$ and write the answer using only positive exponents.

6 Express in simplest form: $\dfrac{\dfrac{1}{2} - \dfrac{4}{d}}{\dfrac{1}{d} + \dfrac{3}{2d}}$

7 If θ is an angle in standard position and its terminal side passes through the point $(-3,2)$, find the exact value of $\csc \theta$.

8 Express $5\sqrt{3x^3} - 2\sqrt{27x^3}$ in simplest radical form.

9 If $f(x) = x^2 - 6$ and $g(x) = 2^x - 1$, determine the value of $(g \circ f)(-3)$.

10 Find, to the *nearest minute*, the angle whose measure is 3.45 radians.

11 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*.

12 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.

13 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 $\sin 240°$.
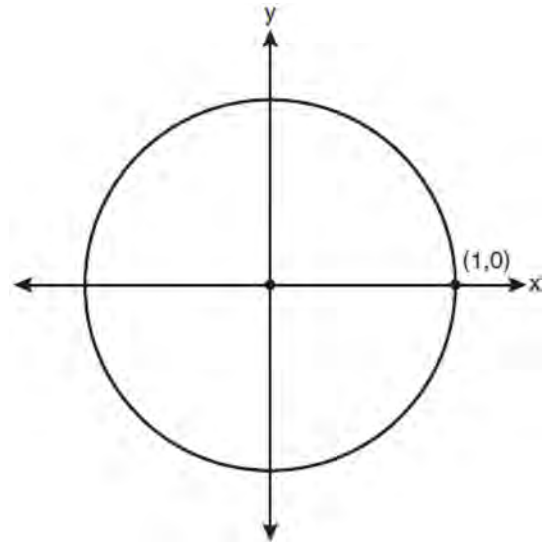
14 Express $\dfrac{\sqrt{108x^5y^8}}{\sqrt{6xy^5}}$ in simplest radical form.

15 Solve the equation $2\tan C - 3 = 3\tan C - 4$ algebraically for all values of C in the interval $0° \le C < 360°$.

16 Factor the expression $12t^8 - 75t^4$ completely.

17 Express $\left(\dfrac{2}{3}x - 1\right)^2$ as a trinomial.

18 Find, to the *nearest tenth of a degree*, the angle whose measure is 2.5 radians.

19 Find the sum and product of the roots of the equation $5x^2 + 11x - 3 = 0$.

20 If $f(x) = x^2 - 6$, find $f^{-1}(x)$.

21 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.

22 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.

23 Express the sum $7 + 14 + 21 + 28 + \ldots + 105$ using sigma notation.

24 Solve algebraically for *x*: $16^{2x+3} = 64^{x+2}$

25 Evaluate $e^{x \ln y}$ when $x = 3$ and $y = 2$.

26 Solve for *x*: $\dfrac{4x}{x-3} = 2 + \dfrac{12}{x-3}$

27 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.*

28 Factor completely: $10ax^2 - 23ax - 5a$

3

29 Evaluate: $10 + \sum_{n=1}^{5}(n^3 - 1)$

30 Use the discriminant to determine all value of k that would result in the equation $x^2 - kx + 4 = 0$ having equal roots.

31 The graph below represents the function $y = f(x)$.
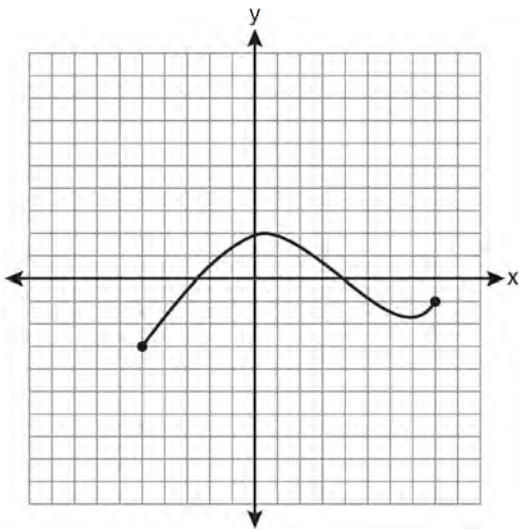
State the domain and range of this function.

32 Express $\dfrac{5}{3 - \sqrt{2}}$ with a rational denominator, in simplest radical form.

33 Starting with $\sin^2 A + \cos^2 A = 1$, derive the formula $\tan^2 A + 1 = \sec^2 A$.

34 Find the first four terms of the recursive sequence defined below.
$$a_1 = -3$$
$$a_n = a_{(n-1)} - n$$

35 Write a quadratic equation such that the sum of its roots is 6 and the product of its roots is -27.

36 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.

37 Find the total number of different twelve-letter arrangements that can be formed using the letters in the word *PENNSYLVANIA*.

38 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.

39 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.

40 The graph of the equation $y = \left(\frac{1}{2}\right)^x$ has an

asymptote. On the grid below, sketch the graph of

$y = \left(\frac{1}{2}\right)^x$ and write the equation of this asymptote.
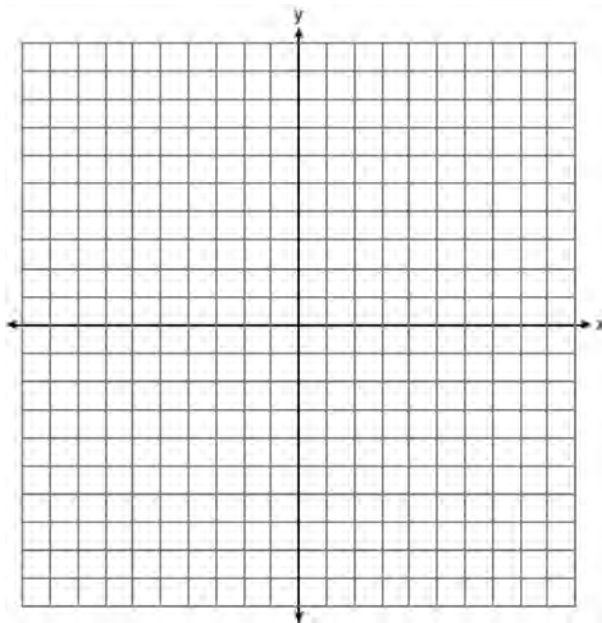
Algebra 2/Trigonometry 4 Point Regents Exam Questions

1 If $\tan A = \dfrac{2}{3}$ and $\sin B = \dfrac{5}{\sqrt{41}}$ and angles A and B are in Quadrant I, find the value of $\tan(A + B)$.

2 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.

3 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?

4 The probability that the Stormville Sluggers will win a baseball game is $\dfrac{2}{3}$. Determine the probability, to the *nearest thousandth*, that the Stormville Sluggers will win *at least* 6 of their next 8 games.

5 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*.

6 Solve $2x^2 - 12x + 4 = 0$ by completing the square, expressing the result in simplest radical form.

7 Solve the equation $8x^3 + 4x^2 - 18x - 9 = 0$ algebraically for all values of x.

8 Express as a single fraction the exact value of $\sin 75°$.

9 The probability that a professional baseball player will get a hit is $\dfrac{1}{3}$. Calculate the exact probability that he will get *at least* 3 hits in 5 attempts.

10 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.

11 Write the binomial expansion of $(2x - 1)^5$ as a polynomial in simplest form.

12 Graph the inequality $-3|6 - x| < -15$ for x. Graph the solution on the line below.

13 Solve algebraically for x: $\dfrac{1}{x+3} - \dfrac{2}{3-x} = \dfrac{4}{x^2 - 9}$

14 Find all values of θ in the interval $0° \le \theta < 360°$ that satisfy the equation $\sin 2\theta = \sin \theta$.

15 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.

Algebra 2/Trigonometry 6 Point Regents Exam Questions

1   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.

2   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.]

3   Solve algebraically for x: $\log_{x+3} \dfrac{x^3 + x - 2}{x} = 2$

4   Solve the following systems of equations algebraically: $5 = y - x$
$$4x^2 = -17x + y + 4$$

5   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.