JEFFERSON MATH PROJECT REGENTS BY PERFORMANCE INDICATOR: TOPIC

NY Algebra 2/Trigonometry Regents Exam Questions from Fall 2009 to June 2012 Sorted by PI: Topic

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.

TABLE OF CONTENTS

Algebra 2/Trigonometry Regents Exam Questions by Performance Indicator: Topic

GRAPHS AND STATISTICS

A2.S.1-2: ANALYSIS OF DATA

1 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.

2 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

3 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.

4 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

5 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

A2.S.3: AVERAGE KNOWN WITH MISSING DATA

6 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 $17 = \frac{119 + x}{x}$

2 $17 = \frac{119 + 16x}{x}$

3 $17 = \frac{446 + x}{26 + x}$

4 $17 = \frac{446 + 16x}{26 + x}$

7 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

A2.S.4: DISPERSION

8 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

9 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*.

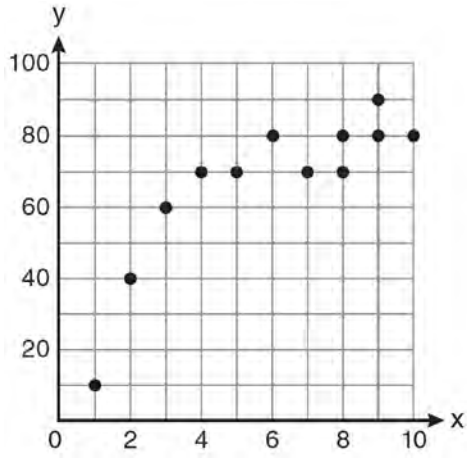
10 During a particular month, a local company surveyed all its employees to determine their travel times to work, in minutes. The data for all 15 employees are shown below.

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

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

A2.S.6-7: REGRESSION

11 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

12 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)	0	2	4	6	8	10
Temperature in °F (y)	180.2	165.8	146.3	135.4	127.7	110.5

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

13 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.

14 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.*

15 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.

A2.S.8: CORRELATION COEFFICIENT

16 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

17 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
$y = a + bx$
$a = -2.9$
$b = 24.1$
$r = -.8924$

18 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

A2.S.5: NORMAL DISTRIBUTIONS

19 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

20 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%

21 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

22 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.

23 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.

PROBABILITY

A2.S.10: PERMUTATIONS

24 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

25 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 $\frac{8!}{4!}$

3 $\frac{8!}{2!+2!}$

4 $\frac{8!}{2!\cdot 2!}$

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

27 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.

A2.S.11: COMBINATIONS

28 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

29 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

30 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

31 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.

A2.S.9: DIFFERENTIATING BETWEEN PERMUTATIONS AND COMBINATIONS

32 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 $\frac{20!}{3!}$

3 ${}_{20}C_3$

4 ${}_{20}P_3$

33 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 $\frac{{}_{15}C_2 \cdot {}_5C_1}{{}_{30}C_3}$

2 $\frac{{}_{15}P_2 \cdot {}_5P_1}{{}_{30}C_3}$

3 $\frac{{}_{15}C_2 \cdot {}_5C_1}{{}_{30}P_3}$

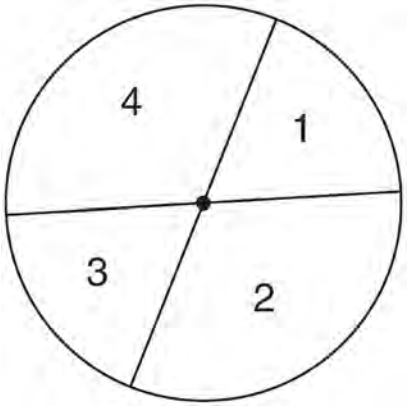
4 $\frac{{}_{15}P_2 \cdot {}_5P_1}{{}_{30}P_3}$

A2.S.12: SAMPLE SPACE

34 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.

A2.S.13: GEOMETRIC PROBABILITY

35 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 $\frac{2}{3}$

A2.S.15: BINOMIAL PROBABILITY

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

37 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 $\frac{25}{64}$

2 $\frac{45}{512}$

3 $\frac{75}{512}$

4 $\frac{225}{512}$

38 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?

39 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.

40 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.

41 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.

ABSOLUTE VALUE

A2.A.1: ABSOLUTE VALUE EQUATIONS AND INEQUALITIES

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

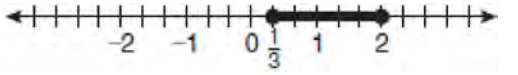
1 $\varnothing$

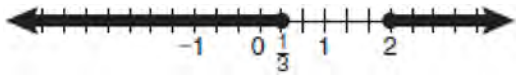
2 $\{0\}$

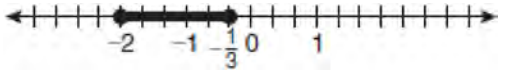
3 $\left\{\frac{1}{2}\right\}$

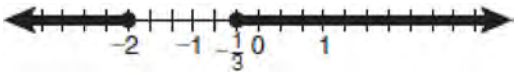
4 $\left\{0, \frac{1}{2}\right\}$

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

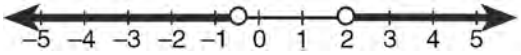
1 

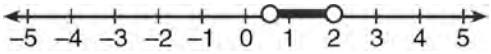
2 

3 

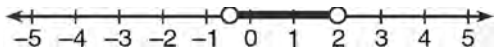
4 

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

1 

2 

3 

4 

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

QUADRATICS

A2.A.20-21: ROOTS OF QUADRATICS

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

1 sum = $-\frac{2}{3}$; product = -2

2 sum = $\frac{2}{3}$; product = -2

3 sum = -2; product = $\frac{2}{3}$

4 sum = -2; product = $-\frac{2}{3}$

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

48 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 $2x^2 - 6x + 4 = 0$

49 For which equation does the sum of the roots equal $\frac{3}{4}$ 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 $4x^2 + 3x - 2 = 0$

50 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 $4x^2 - 9x - 3 = 0$

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

A2.A.7: FACTORING POLYNOMIALS

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

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

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

A2.A.7: FACTORING THE DIFFERENCE OF PERFECT SQUARES

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

A2.A.7: FACTORING BY GROUPING

56 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 $(x^2 - 4)(x - 3)$

A2.A.25: QUADRATIC FORMULA

57 The roots of the equation $2x^2 + 7x - 3 = 0$ are

1 $-\frac{1}{2}$ and -3
2 $\frac{1}{2}$ and 3
3 $\frac{-7 \pm \sqrt{73}}{4}$
4 $\frac{7 \pm \sqrt{73}}{4}$

58 The solutions of the equation $y^2 - 3y = 9$ are

1 $\frac{3 \pm 3i\sqrt{3}}{2}$
2 $\frac{3 \pm 3i\sqrt{5}}{2}$
3 $\frac{-3 \pm 3\sqrt{5}}{2}$
4 $\frac{3 \pm 3\sqrt{5}}{2}$

A2.A.2: USING THE DISCRIMINANT

59 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

60 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

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

A2.A.24: COMPLETING THE SQUARE

62 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 $\frac{7}{2}$

2 $\frac{49}{4}$

3 $\frac{49}{2}$

4 49

63 If $x^2 + 2 = 6x$ is solved by completing the square, an intermediate step would be

1 $(x+3)^2 = 7$

2 $(x-3)^2 = 7$

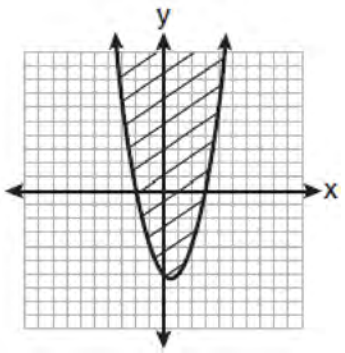
3 $(x-3)^2 = 11$

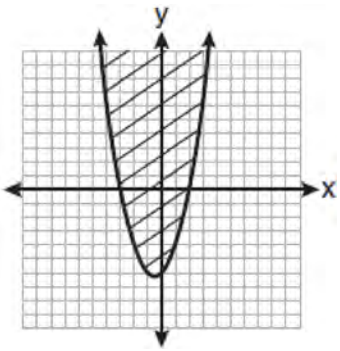
4 $(x-6)^2 = 34$

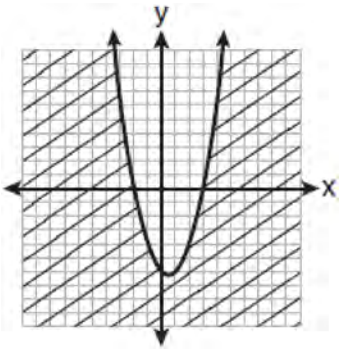
64 Solve $2x^2 - 12x + 4 = 0$ by completing the square, expressing the result in simplest radical form.

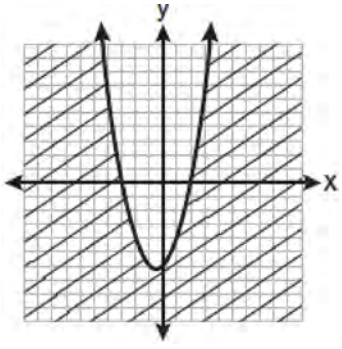
A2.A.4: QUADRATIC INEQUALITIES

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

1 

2 

3 

4 

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

67 Find the solution of the inequality $x^2 - 4x > 5$, algebraically.

SYSTEMS

A2.A.3: QUADRATIC-LINEAR SYSTEMS

68 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 $-6, 2$

69 Solve the following systems of equations algebraically: $5 = y - x$

$$4x^2 = -17x + y + 4$$

POWERS

A2.N.3: OPERATIONS WITH POLYNOMIALS

70 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 product of $\left(\frac{x}{4} - \frac{1}{3}\right)$ and $\left(\frac{x}{4} + \frac{1}{3}\right)$?
1 $\frac{x^2}{8} - \frac{1}{9}$
2 $\frac{x^2}{16} - \frac{1}{9}$
3 $\frac{x^2}{8} - \frac{x}{6} - \frac{1}{9}$
4 $\frac{x^2}{16} - \frac{x}{6} - \frac{1}{9}$

72 What is the product of $\left(\frac{2}{5}x - \frac{3}{4}y^2\right)$ and $\left(\frac{2}{5}x + \frac{3}{4}y^2\right)$?
1 $\frac{4}{25}x^2 - \frac{9}{16}y^4$
2 $\frac{4}{25}x - \frac{9}{16}y^2$
3 $\frac{2}{5}x^2 - \frac{3}{4}y^4$
4 $\frac{4}{5}x$

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

74 Express the product of $\left(\frac{1}{2}y^2 - \frac{1}{3}y\right)$ and $\left(12y + \frac{3}{5}\right)$ as a trinomial.

A2.N.1, A.8-9: NEGATIVE AND FRACTIONAL EXPONENTS

75 If $a = 3$ and $b = -2$, what is the value of the expression $\frac{a^{-2}}{b^{-3}}$?
1 $-\frac{9}{8}$
2 -1
3 $-\frac{8}{9}$
4 $\frac{8}{9}$

76 When simplified, the expression $\left(\frac{w^{-5}}{w^{-9}}\right)^{\frac{1}{2}}$ is equivalent to

1 w^{-7}
2 w^{2}
3 w^{7}
4 w^{14}

77 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 $a^{-2}b^{-1}$

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

1 $\frac{x^{4}y^{5}}{3}$
2 $\frac{x^{5}y^{4}}{3}$
3 $3x^{4}y^{5}$
4 $\frac{y^{4}}{3x^{5}}$

79 Simplify the expression $\frac{3x^{-4}y^{5}}{(2x^{3}y^{-7})^{-2}}$ and write the answer using only positive exponents.

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

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

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

1 1
2 $\frac{1}{x}$
3 x
4 $-\frac{1}{x}$

A2.A.12: EVALUATING EXPONENTIAL EXPRESSIONS

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

83 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%.

84 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.

A2.A.18: EVALUATING LOGARITHMIC EXPRESSIONS

85 The expression $\log_{8}64$ is equivalent to

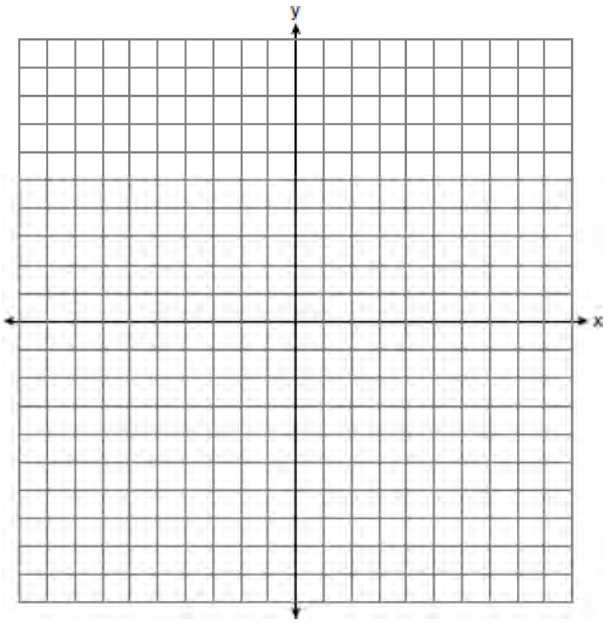
1 8
2 2
3 $\frac{1}{2}$
4 $\frac{1}{8}$

86 The expression $\log_5\left(\frac{1}{25}\right)$ is equivalent to

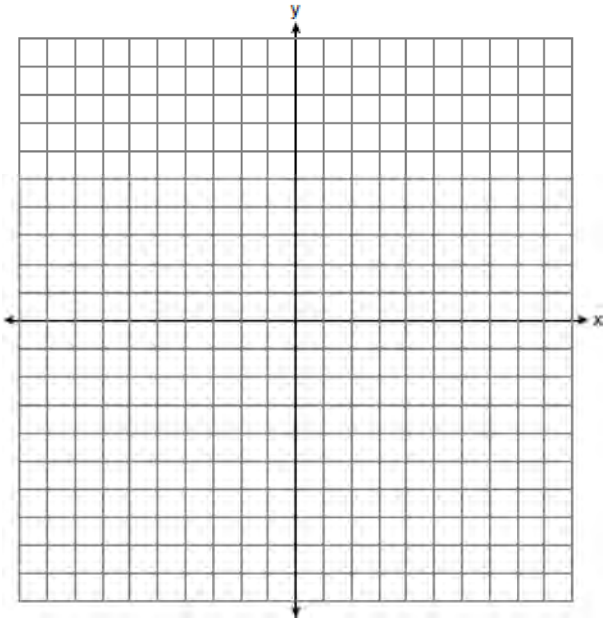
1 $\frac{1}{2}$
2 2
3 $-\frac{1}{2}$
4 -2

A2.A.53: GRAPHING EXPONENTIAL FUNCTIONS

87 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.



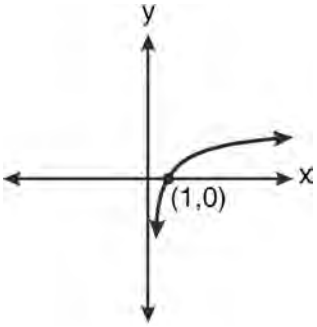
88 On the axes below, for $-2 \le x \le 2$, graph $y = 2^{x+1} - 3$.



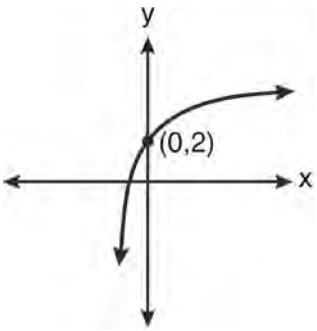
A2.A.54: GRAPHING LOGARITHMIC FUNCTIONS

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

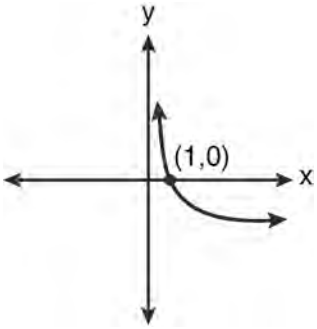
1



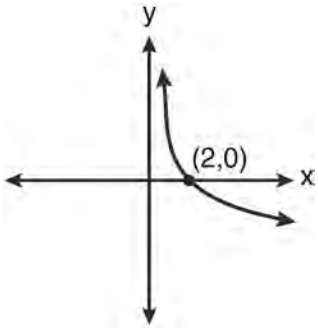
2



3

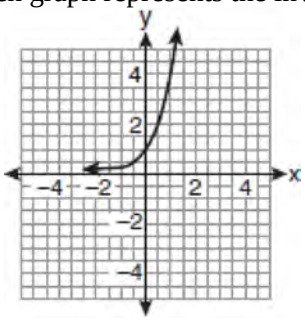


4

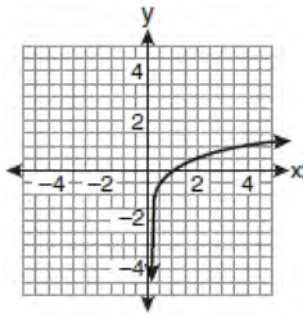


90 If a function is defined by the equation $f(x) = 4^x$, which graph represents the inverse of this function?

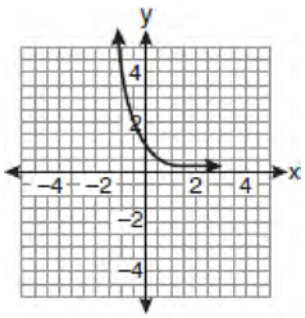
1



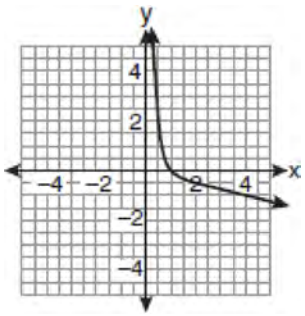
2



3



4



A2.A.19: PROPERTIES OF LOGARITHMS

91 The expression $2\log x - (3\log y + \log z)$ is equivalent to

1 $\log \frac{x^2}{y^3 z}$

2 $\log \frac{x^2 z}{y^3}$

3 $\log \frac{2x}{3yz}$

4 $\log \frac{2xz}{3y}$

92 If $r = \sqrt[3]{\frac{A^2 B}{C}}$, then $\log r$ can be represented by

1 $\frac{1}{6}\log A + \frac{1}{3}\log B - \log C$

2 $3(\log A^2 + \log B - \log C)$

3 $\frac{1}{3}\log(A^2 + B) - C$

4 $\frac{2}{3}\log A + \frac{1}{3}\log B - \frac{1}{3}\log C$

93 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 $\log 6 + 2\log a$

94 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 $\frac{p^3}{\sqrt{t^2 r}}$

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

3 $\frac{p^3 t^2}{\sqrt{r}}$

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

A2.A.28: LOGARITHMIC EQUATIONS

95 What is the value of x in the equation $\log_5 x = 4$?

1 1.16
2 20
3 625
4 1,024

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

1 6.4
2 2.56
3 $\frac{9}{5}$
4 $\frac{8}{5}$

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

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

99 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.]

A2.A.6, 27: EXPONENTIAL EQUATIONS

100 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

101 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

102 What is the value of *x* in the equation $9^{3x+1} = 27^{x+2}$?

1 1
2 $\frac{1}{3}$
3 $\frac{1}{2}$
4 $\frac{4}{3}$

103 The value of *x* in the equation $4^{2x+5} = 8^{3x}$ is

1 1
2 2
3 5
4 –10

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

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

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

106 Solve algebraically for all values of *x*:

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

A2.A.36: BINOMIAL EXPANSIONS

107 What is the fourth term in the expansion of $(3x-2)^5$?

1 $-720x^2$
2 $-240x$
3 $720x^2$
4 $1,080x^3$

108 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

109 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 $2x^4y^2$

110 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 $\frac{15}{4}x^4y^2$

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

A2.A.26, 50: SOLVING POLYNOMIAL EQUATIONS

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

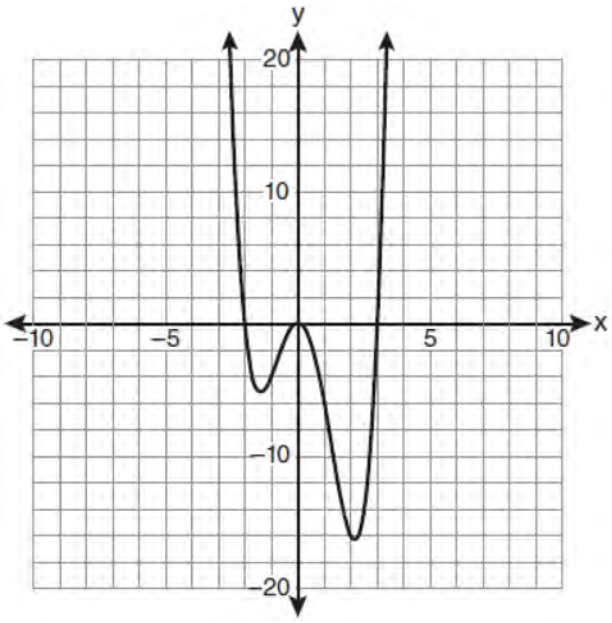
1 $\{0, \pm 2\}$
2 $\{0, \pm 2, 3\}$
3 $\{0, \pm 2, \pm 2i\}$
4 $\{\pm 2, \pm 2i\}$

113 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 $0, -1, -2$

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

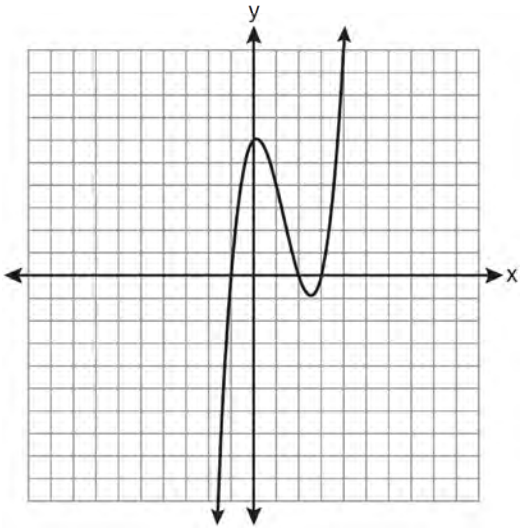
115 The graph of $y = f(x)$ is shown below.



Which set lists all the real solutions of $f(x) = 0$?

1 $\{-3, 2\}$
2 $\{-2, 3\}$
3 $\{-3, 0, 2\}$
4 $\{-2, 0, 3\}$

116 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

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

1 1
2 2
3 3
4 0

RADICALS

A2.A.13: SIMPLIFYING RADICALS

118 The expression $\sqrt[3]{64a^{16}}$ is equivalent to

1 $8a^4$
2 $8a^8$
3 $4a^5\sqrt[3]{a}$
4 $4a\sqrt[3]{a^5}$

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

A2.N.2, A.14: OPERATIONS WITH RADICALS

120 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

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

122 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 $-5ab\sqrt{2b} + 7ab\sqrt{6b}$

123 Express $\frac{\sqrt{108x^5y^8}}{\sqrt{6xy^5}}$ in simplest radical form.

A2.N.5, A.15: RATIONALIZING DENOMINATORS

124 The expression $\frac{4}{5-\sqrt{13}}$ is equivalent to

1 $\frac{4\sqrt{13}}{5\sqrt{13}-13}$
2 $\frac{4(5-\sqrt{13})}{38}$
3 $\frac{5+\sqrt{13}}{3}$
4 $\frac{4(5+\sqrt{13})}{38}$

125 Which expression is equivalent to $\frac{\sqrt{3}+5}{\sqrt{3}-5}$?

1 $-\frac{14+5\sqrt{3}}{11}$

2 $-\frac{17+5\sqrt{3}}{11}$

3 $\frac{14+5\sqrt{3}}{14}$

4 $\frac{17+5\sqrt{3}}{14}$

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

127 The fraction $\frac{3}{\sqrt{3a^2b}}$ is equivalent to

1 $\frac{1}{a\sqrt{b}}$

2 $\frac{\sqrt{b}}{ab}$

3 $\frac{\sqrt{3b}}{ab}$

4 $\frac{\sqrt{3}}{a}$

128 The expression $\frac{2x+4}{\sqrt{x+2}}$ is equivalent to

1 $\frac{(2x+4)\sqrt{x-2}}{x-2}$

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

3 $2\sqrt{x-2}$

4 $2\sqrt{x+2}$

A2.A.22: SOLVING RADICALS

129 The solution set of the equation $\sqrt{x+3}=3-x$ is

1 $\{1\}$

2 $\{0\}$

3 $\{1,6\}$

4 $\{2,3\}$

130 The solution set of $\sqrt{3x+16}=x+2$ is

1 $\{-3,4\}$

2 $\{-4,3\}$

3 $\{3\}$

4 $\{-4\}$

131 What is the solution set for the equation $\sqrt{5x+29}=x+3$?

1 $\{4\}$

2 $\{-5\}$

3 $\{4,5\}$

4 $\{-5,4\}$

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

A2.A.10-11: EXPONENTS AS RADICALS

133 The expression $x^{-\frac{2}{5}}$ is equivalent to

1 $-\sqrt[2]{x^5}$

2 $-\sqrt[5]{x^2}$

3 $\frac{1}{\sqrt[2]{x^5}}$

4 $\frac{1}{\sqrt[5]{x^2}}$

134 The expression $(x^2-1)^{-\frac{2}{3}}$ is equivalent to
1 $\sqrt[3]{(x^2-1)^2}$
2 $\frac{1}{\sqrt[3]{(x^2-1)^2}}$
3 $\sqrt{(x^2-1)^3}$
4 $\frac{1}{\sqrt{(x^2-1)^3}}$

135 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 $4x^8y^{28}$

A2.N.6: SQUARE ROOTS OF NEGATIVE NUMBERS

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

A2.N.7: IMAGINARY NUMBERS

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

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

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

A2.N.8: CONJUGATES OF COMPLEX NUMBERS

140 What is the conjugate of $-2+3i$?
1 $-3+2i$
2 $-2-3i$
3 $2-3i$
4 $3+2i$

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

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

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

A2.N.9: MULTIPLICATION AND DIVISION OF COMPLEX NUMBERS

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

RATIONALS

A2.A.16: MULTIPLICATION AND DIVISION OF RATIONALS

145 Express in simplest form: $\dfrac{\dfrac{4-x^2}{x^2+7x+12}}{\dfrac{2x-4}{x+3}}$

146 Perform the indicated operations and simplify completely:

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

A2.A.23: SOLVING RATIONALS

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

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

A2.A.17: COMPLEX FRACTIONS

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

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

A2.A.5: INVERSE VARIATION

151 If p varies inversely as q, and $p = 10$ when $q = \frac{3}{2}$, what is the value of p when $q = \frac{3}{5}$?

1 25
2 15
3 9
4 4

152 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.

FUNCTIONS

A2.A.40-41: FUNCTIONAL NOTATION

153 The equation $y-2\sin\theta=3$ may be rewritten as

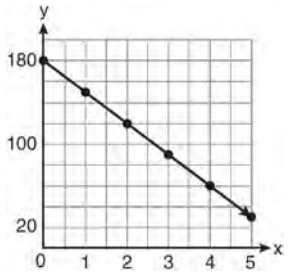
1 $f(y)=2\sin x+3$
2 $f(y)=2\sin\theta+3$
3 $f(x)=2\sin\theta+3$
4 $f(\theta)=2\sin\theta+3$

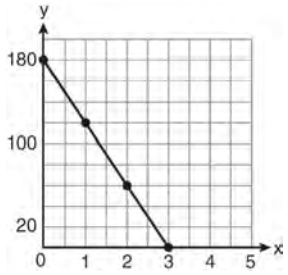
154 If $f(x)=\dfrac{x}{x^2-16}$, what is the value of $f(-10)$?

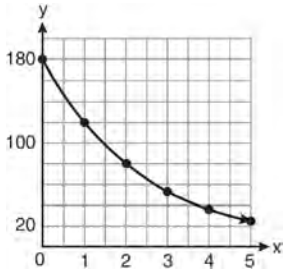
1 $-\dfrac{5}{2}$
2 $-\dfrac{5}{42}$
3 $\dfrac{5}{58}$
4 $\dfrac{5}{18}$

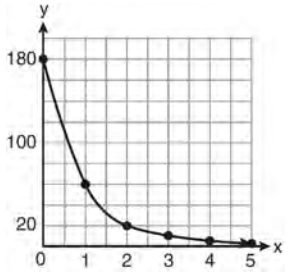
A2.A.52: FAMILIES OF FUNCTIONS

155 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 

A2.A.52: PROPERTIES OF GRAPHS OF FUNCTIONS AND RELATIONS

156 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 $(e, 1)$.

A2.A.52: IDENTIFYING THE EQUATION OF A GRAPH

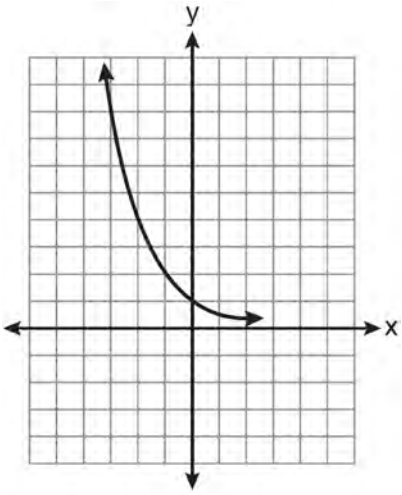
157 Four points on the graph of the function f(x) are shown below.

$$\{(0,1),(1,2),(2,4),(3,8)\}$$

Which equation represents f(x)?

1 $f(x) = 2^x$
2 $f(x) = 2x$
3 $f(x) = x + 1$
4 $f(x) = \log_2 x$

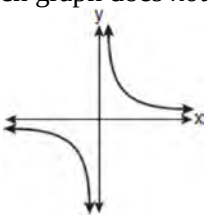
158 Which equation is represented by the graph below?

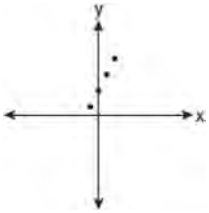


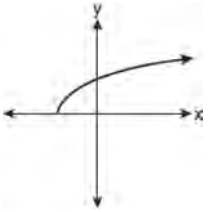
1 $y = 5^x$
2 $y = 0.5^x$
3 $y = 5^{-x}$
4 $y = 0.5^{-x}$

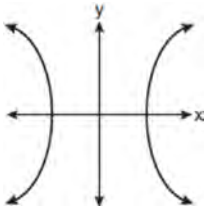
A2.A.38, 43: DEFINING FUNCTIONS

159 Which graph does *not* represent a function?

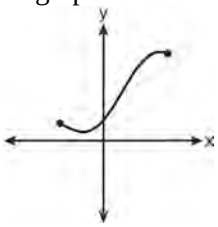
1 

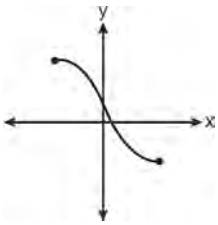
2 

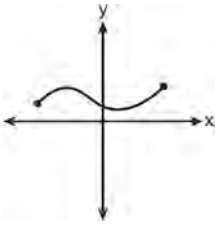
3 

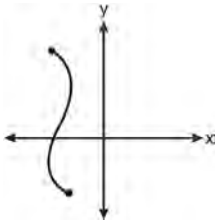
4 

160 Which graph does *not* represent a function?

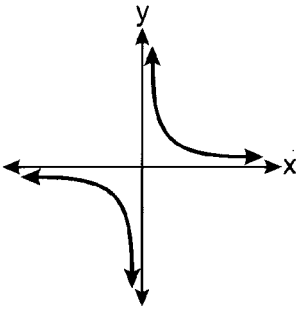
1 

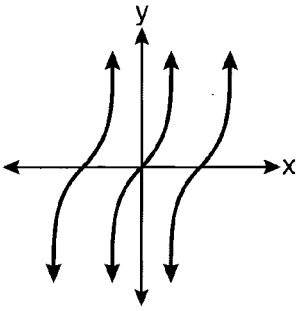
2 

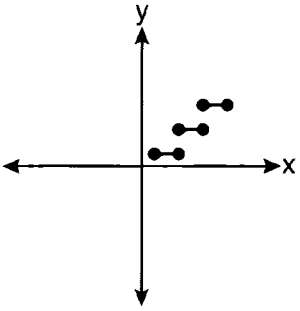
3 

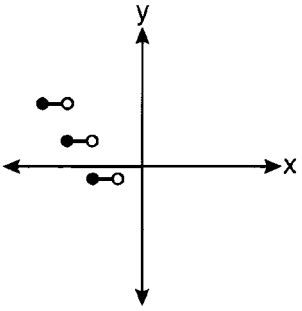
4 

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

1 

2 

3 

4 

162 Which relation is *not* a function?

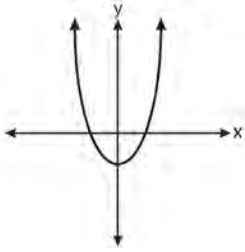
1 $(x-2)^2+y^2=4$

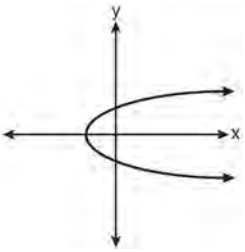
2 $x^2+4x+y=4$

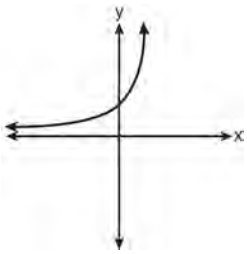
3 $x+y=4$

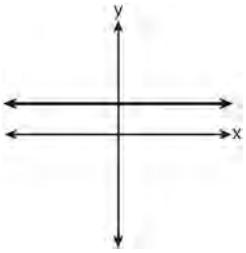
4 $xy=4$

163 Which graph represents a one-to-one function?

1 

2 

3 

4 

164 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 $\{(0,1),(1,0),(2,0),(3,2)\}$

165 Which function is one-to-one?

1 $f(x)=|x|$

2 $f(x)=2^x$

3 $f(x)=x^2$

4 $f(x)=\sin x$

166 Which function is one-to-one?

1 $k(x) = x^2 + 2$
2 $g(x) = x^3 + 2$
3 $f(x) = |x| + 2$
4 $j(x) = x^4 + 2$

A2.A.39, 51: DOMAIN AND RANGE

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

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

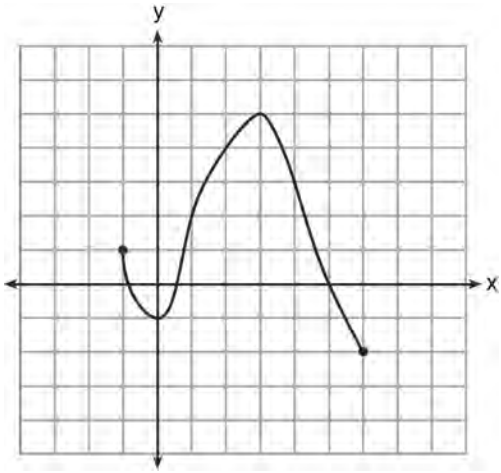
168 What is the range of $f(x) = (x+4)^2 + 7$?

1 $y \geq -4$
2 $y \geq 4$
3 $y = 7$
4 $y \geq 7$

169 What is the range of $f(x) = |x-3| + 2$?

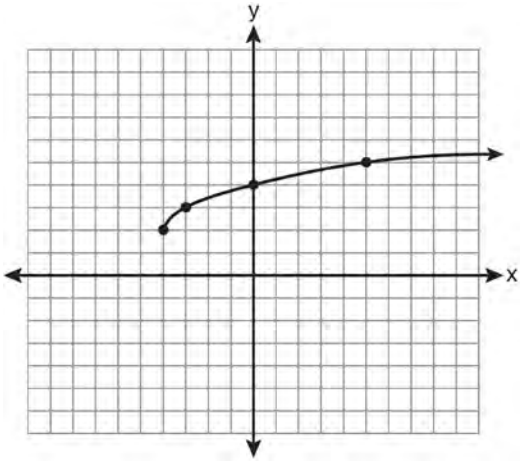
1 $\{x \mid x \geq 3\}$
2 $\{y \mid y \geq 2\}$
3 $\{x \mid x \in \text{real numbers}\}$
4 $\{y \mid y \in \text{real numbers}\}$

170 What is the domain of the function shown below?



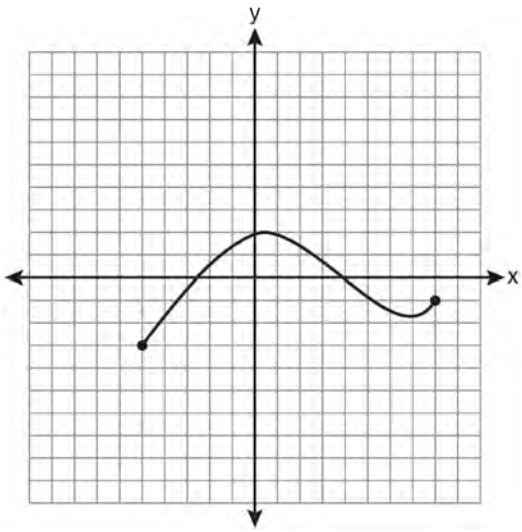
1 $-1 \leq x \leq 6$
2 $-1 \leq y \leq 6$
3 $-2 \leq x \leq 5$
4 $-2 \leq y \leq 5$

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

172 The graph below represents the function $y = f(x)$.



State the domain and range of this function.

A2.A.42: COMPOSITIONS OF FUNCTIONS

173 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

174 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 $x^2 + 6x - 5$

175 If $f(x) = 4x - x^2$ and $g(x) = \frac{1}{x}$, then $(f \circ g)\left(\frac{1}{2}\right)$ is equal to
1 $\frac{4}{7}$
2 -2
3 $\frac{7}{2}$
4 4

176 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 $3\sin^2 x$

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

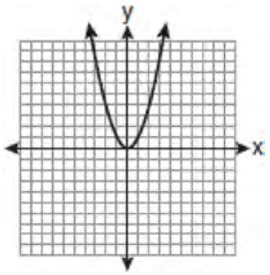
A2.A.44: INVERSE OF FUNCTIONS

178 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 $g(x) = -\frac{1}{2}x + 4$

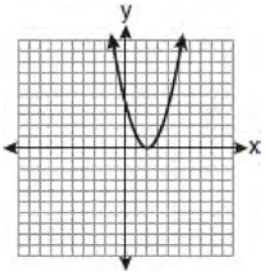
179 If $f(x) = x^2 - 6$, find $f^{-1}(x)$.

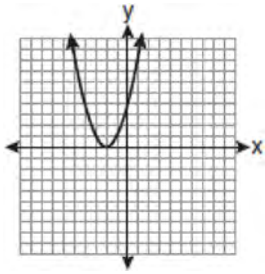
A2.A.46: TRANSFORMATIONS WITH FUNCTIONS AND RELATIONS

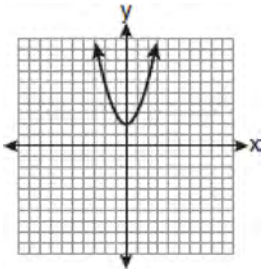
180 The graph below shows the function f(x).

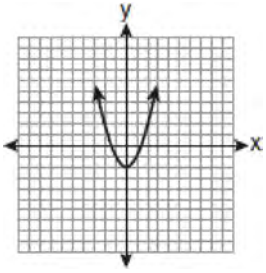


Which graph represents the function f($x+2$)?

1


2


3


4


181 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 $(-6,-3)$

SEQUENCES AND SERIES

A2.A.29-33: SEQUENCES

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

183 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 $a_n = 4(2.5)^{n-1}$

184 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 $a_n = 54\left(\frac{1}{3}\right)^{n-1}$

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

1 $\frac{8}{5}$
2 -3
3 3
4 9

186 Which arithmetic sequence has a common difference of 4?

1 $\{0, 4n, 8n, 12n, \ldots\}$
2 $\{n, 4n, 16n, 64n, \ldots\}$
3 $\{n+1, n+5, n+9, n+13, \ldots\}$
4 $\{n+4, n+16, n+64, n+256, \ldots\}$

187 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 $\frac{37}{3}$

188 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

189 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 $16384\sqrt{10}$

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

191 Find the first four terms of the recursive sequence defined below.

$$a_1 = -3$$

$$a_n = a_{(n-1)} - n$$

A2.N.10, A.34: SIGMA NOTATION

192 The value of the expression $\sum_{r=3}^{5}(-r^2 + r)$ is

1 -38
2 -12
3 26
4 62

193 The value of the expression $2\sum_{n=0}^{2}(n^2 + 2^n)$ is

1 12
2 22
3 24
4 26

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

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

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

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

1 $\sum_{n=5}^{43} n$

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

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

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

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

A2.A.35: SERIES

199 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

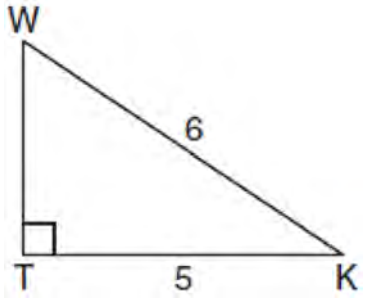
200 What is the sum of the first 19 terms of the sequence $3, 10, 17, 24, 31, \ldots$?

1 1188
2 1197
3 1254
4 1292

TRIGONOMETRY

A2.A.55: TRIGONOMETRIC RATIOS

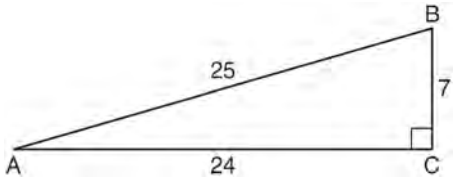
201 In the diagram below of right triangle KTW, $KW = 6$, $KT = 5$, and $m\angle KTW = 90$.



What is the measure of $\angle K$, to the *nearest minute*?

1 33°33'
2 33°34'
3 33°55'
4 33°56'

202 Which ratio represents $\csc A$ in the diagram below?



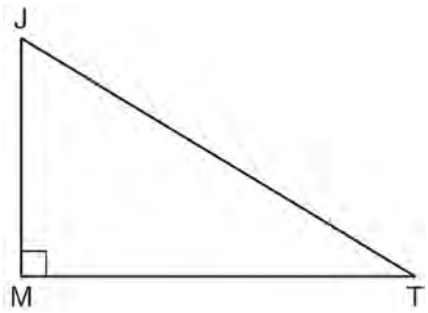
1 $\frac{25}{24}$

2 $\frac{25}{7}$

3 $\frac{24}{7}$

4 $\frac{7}{24}$

203 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 $\frac{\sqrt{3}}{3}$

2 2

3 $\sqrt{3}$

4 $\frac{2\sqrt{3}}{3}$

A2.M.1-2: RADIAN MEASURE

204 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 $\frac{7\pi}{6}$

205 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 $\frac{7\pi}{3}$

206 What is the number of degrees in an angle whose measure is 2 radians?

1 $\frac{360}{\pi}$

2 $\frac{\pi}{360}$

3 360

4 90

207 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

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

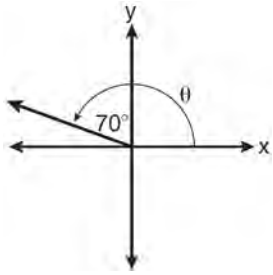
209 Find, to the *nearest tenth of a degree*, the angle whose measure is 2.5 radians.

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

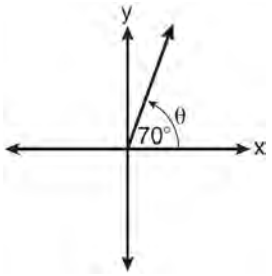
A2.A.60: UNIT CIRCLE

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

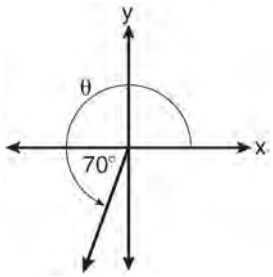
1



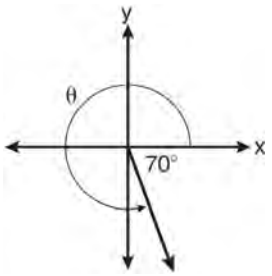
2



3

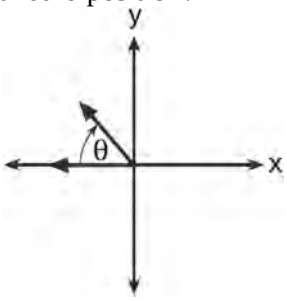


4

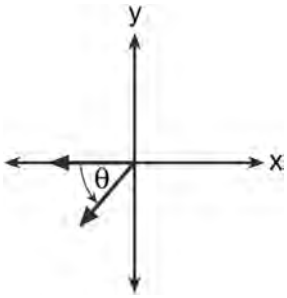


212 If $m\angle\theta = -50$, which diagram represents θ drawn in standard position?

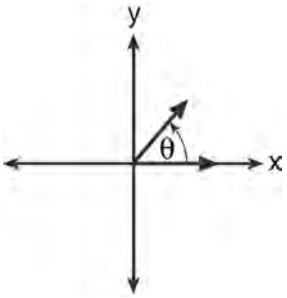
1



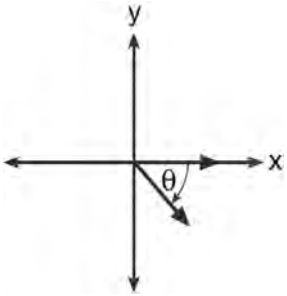
2



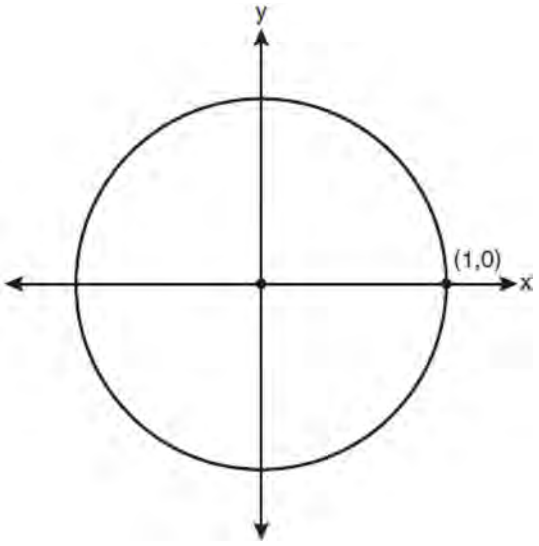
3



4



213 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 $\sin 240°$.



A2.A.62, 66: DETERMINING TRIGONOMETRIC FUNCTIONS

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

215 The value of $\tan 126°43'$ to the *nearest ten-thousandth* is
1 −1.3407
2 −1.3408
3 −1.3548
4 −1.3549

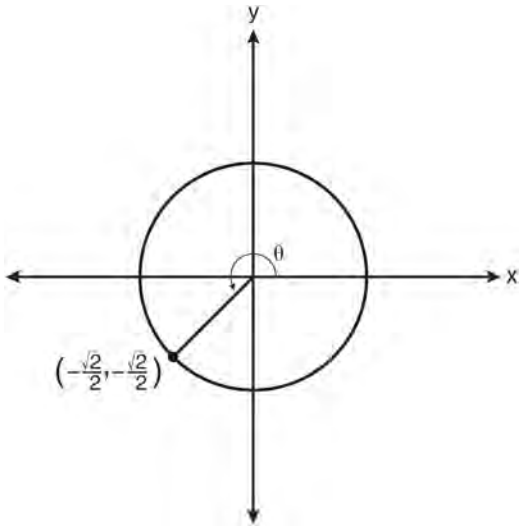
216 The value of $\csc 138°23'$ rounded to four decimal places is
1 −1.3376
2 −1.3408
3 1.5012
4 1.5057

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

A2.A.64: USING INVERSE TRIGONOMETRIC FUNCTIONS

218 What is the principal value of $\cos^{-1}\left(-\frac{\sqrt{3}}{2}\right)$?
1 −30°
2 60°
3 150°
4 240°

219 In the diagram below of a unit circle, the ordered pair $\left(-\frac{\sqrt{2}}{2},-\frac{\sqrt{2}}{2}\right)$ 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

220 If $\sin^{-1}\left(\frac{5}{8}\right) = A$, then

1 $\sin A = \frac{5}{8}$

2 $\sin A = \frac{8}{5}$

3 $\cos A = \frac{5}{8}$

4 $\cos A = \frac{8}{5}$

A2.A.57: REFERENCE ANGLES

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

1 $-\cos 55°$

2 $\cos 55°$

3 $-\sin 55°$

4 $\sin 55°$

A2.A.61: ARC LENGTH

222 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

223 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 $\frac{3\pi}{4}$

2 π

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

4 3π

A2.A.58-59: COFUNCTION AND RECIPROCAL TRIGONOMETRIC FUNCTIONS

224 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 $\cot(90° - A) = \frac{1}{3}$

225 The expression $\frac{\sin^2\theta + \cos^2\theta}{1 - \sin^2\theta}$ is equivalent to

1 $\cos^2\theta$

2 $\sin^2\theta$

3 $\sec^2\theta$

4 $\csc^2\theta$

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

227 Express the exact value of $\csc 60°$, with a rational denominator.

A2.A.67: PROVING TRIGONOMETRIC IDENTITIES

228 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 $\cos x + \sin x$

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

A2.A.76: ANGLE SUM AND DIFFERENCE IDENTITIES

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

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

232 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 $\tan(A + B)$.

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

A2.A.77: DOUBLE AND HALF ANGLE IDENTITIES

234 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 $-\cos^2\theta - 1$

235 If $\sin A = \frac{2}{3}$ where $0° < A < 90°$, what is the value of $\sin 2A$?
1 $\frac{2\sqrt{5}}{3}$
2 $\frac{2\sqrt{5}}{9}$
3 $\frac{4\sqrt{5}}{9}$
4 $-\frac{4\sqrt{5}}{9}$

236 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

A2.A.68: TRIGONOMETRIC EQUATIONS

237 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 $\{60°, 300°\}$

238 What are the values of θ in the interval $0° \le \theta < 360°$ that satisfy the equation $\tan\theta - \sqrt{3} = 0$?
1 60º, 240º
2 72º, 252º
3 72º, 108º, 252º, 288º
4 60º, 120º, 240º, 300º

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

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

Algebra 2/Trigonometry Regents Exam Questions by Performance Indicator: Topic

A2.A.69: PROPERTIES OF TRIGONOMETRIC FUNCTIONS

241 What is the period of the function $f(\theta) = -2\cos 3\theta$?

1 π

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

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

4 2π

242 What is the period of the function $y = \frac{1}{2}\sin\left(\frac{x}{3} - \pi\right)$?

1 $\frac{1}{2}$

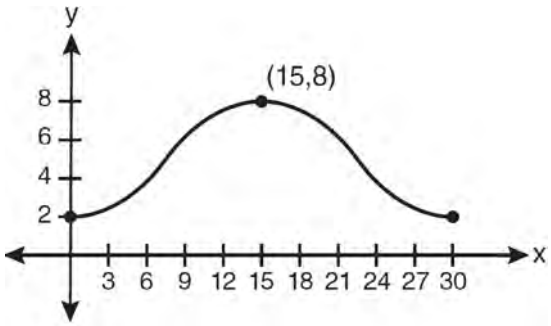
2 $\frac{1}{3}$

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

4 6π

A2.A.72: IDENTIFYING THE EQUATION OF A TRIGONOMETRIC GRAPH

243 Which equation is graphed in the diagram below?



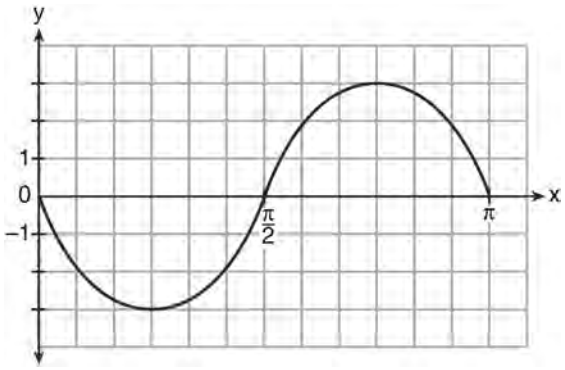
1 $y = 3\cos\left(\frac{\pi}{30}x\right) + 8$

2 $y = 3\cos\left(\frac{\pi}{15}x\right) + 5$

3 $y = -3\cos\left(\frac{\pi}{30}x\right) + 8$

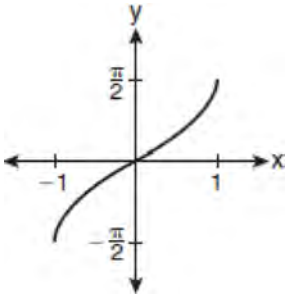
4 $y = -3\cos\left(\frac{\pi}{15}x\right) + 5$

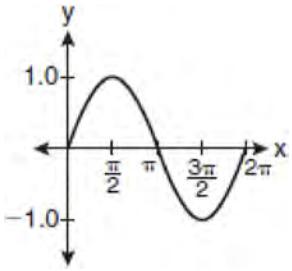
244 Write an equation for the graph of the trigonometric function shown below.

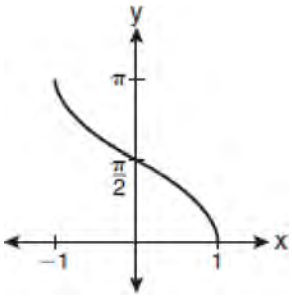


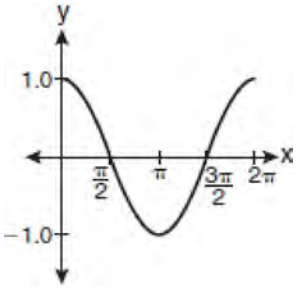
A2.A.65, 70-71: GRAPHING TRIGONOMETRIC FUNCTIONS

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

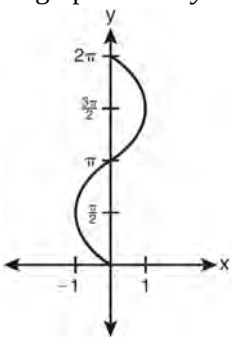
1 

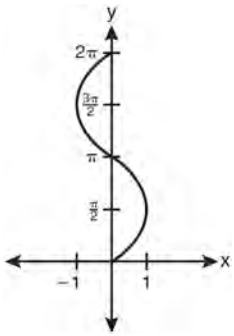
2 

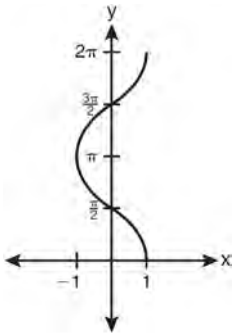
3 

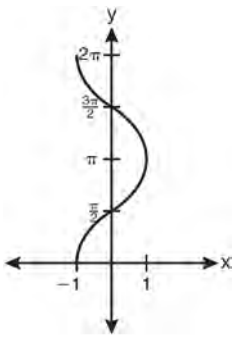
4 

246 Which graph shows $y = \cos^{-1} x$?

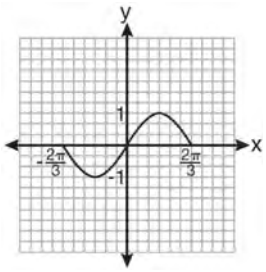
1 

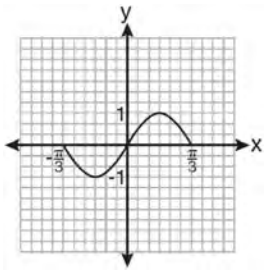
2 

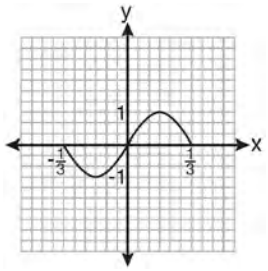
3 

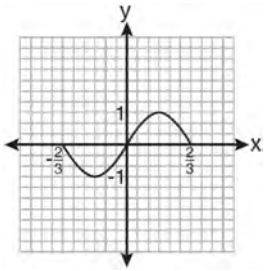
4 

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

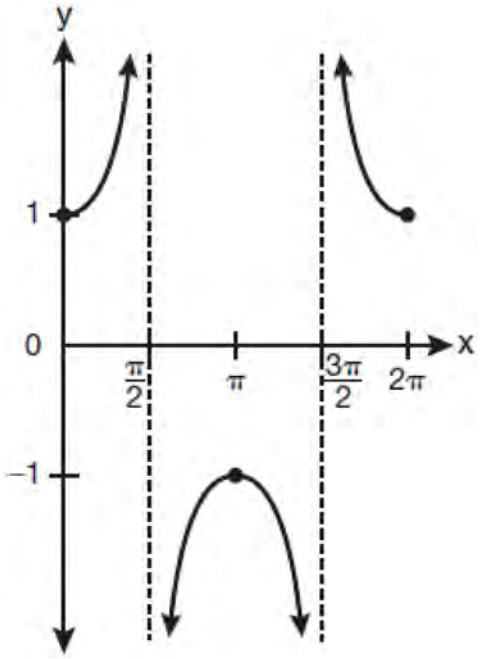
1


2


3


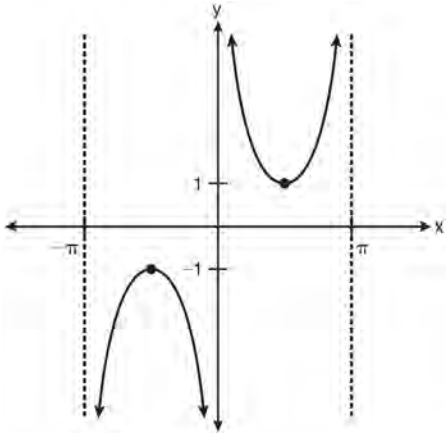
4


248 Which equation is represented by the graph below?



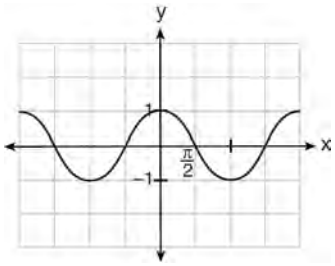
1 $y = \cot x$
2 $y = \csc x$
3 $y = \sec x$
4 $y = \tan x$

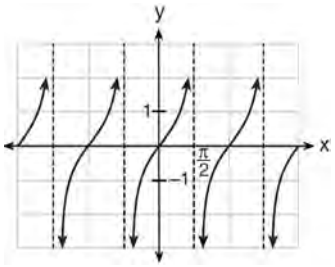
249 Which equation is sketched in the diagram below?

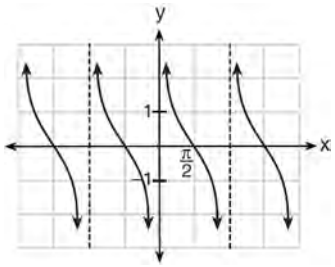


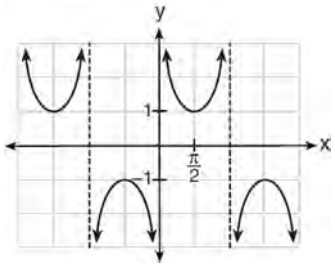
1 $y = \csc x$
2 $y = \sec x$
3 $y = \cot x$
4 $y = \tan x$

250 Which is a graph of $y = \cot x$?

1 

2 

3 

4 

A2.A.63: DOMAIN AND RANGE

251 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 $\left\{x \mid -\frac{\pi}{2} < x < \frac{\pi}{2}\right\}$

4 $\left\{x \mid -\frac{\pi}{2} < x < \frac{3\pi}{2}\right\}$

252 In which interval of $f(x) = \cos(x)$ is the inverse also a function?

1 $-\frac{\pi}{2} < x < \frac{\pi}{2}$

2 $-\frac{\pi}{2} \le x \le \frac{\pi}{2}$

3 $0 \le x \le \pi$

4 $\frac{\pi}{2} \le x \le \frac{3\pi}{2}$

A2.A.74: USING TRIGONOMETRY TO FIND AREA

253 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

254 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

255 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 $\triangle BLF$?

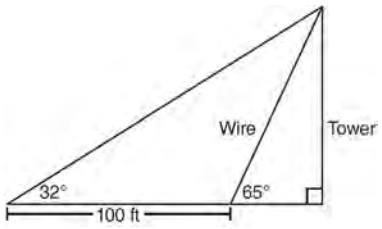
1 11.4
2 14.1
3 22.7
4 28.1

256 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*.

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

A2.A.73: LAW OF SINES

258 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*.



259 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*.

A2.A.75: LAW OF SINES-THE AMBIGUOUS CASE

260 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

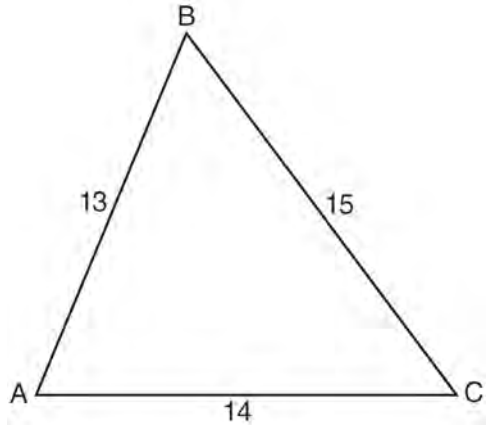
261 Given $\triangle ABC$ with $a = 9$, $b = 10$, and $m\angle B = 70$, what type of triangle can be drawn?
1 an acute triangle, only
2 an obtuse triangle, only
3 both an acute triangle and an obtuse triangle
4 neither an acute triangle nor an obtuse triangle

262 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

263 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

A2.A.73: LAW OF COSINES

264 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

265 In $\triangle ABC$, $a = 3$, $b = 5$, and $c = 7$. What is $m\angle C$?
1 22
2 38
3 60
4 120

266 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.

A2.A.73: VECTORS

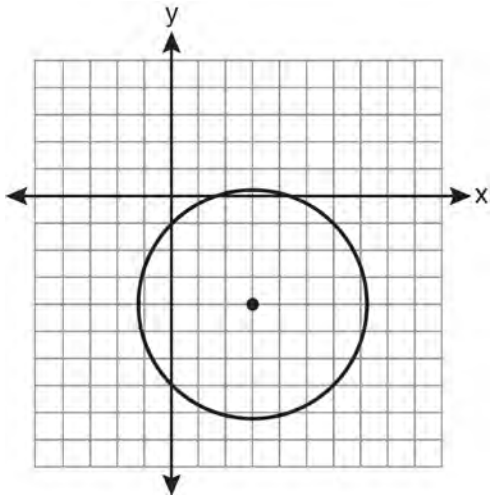
267 Two forces of 25 newtons and 85 newtons acting on a body form an angle of 55°. Find the magnitude of the resultant force, to the *nearest hundredth of a newton*. Find the measure, to the *nearest degree*, of the angle formed between the resultant and the larger force.

268 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.

CONICS

A2.A.47, 49: EQUATIONS OF CIRCLES

269 Which equation represents the circle shown in the graph below that passes through the point $(0,-1)$?



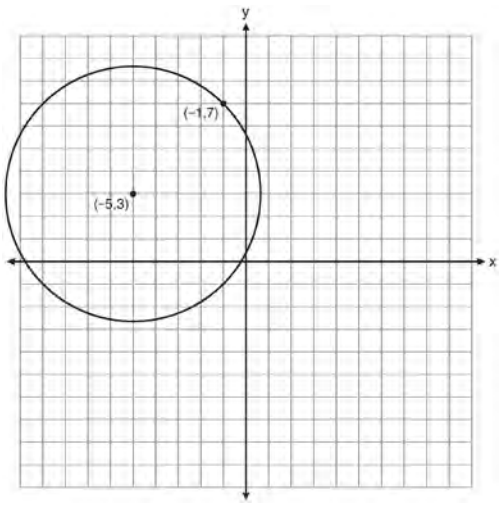
1 $(x-3)^2+(y+4)^2=16$

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

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

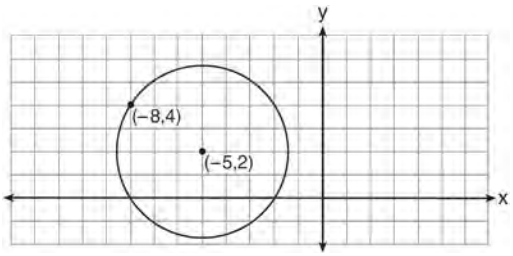
4 $(x+3)^2+(y-4)^2=18$

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

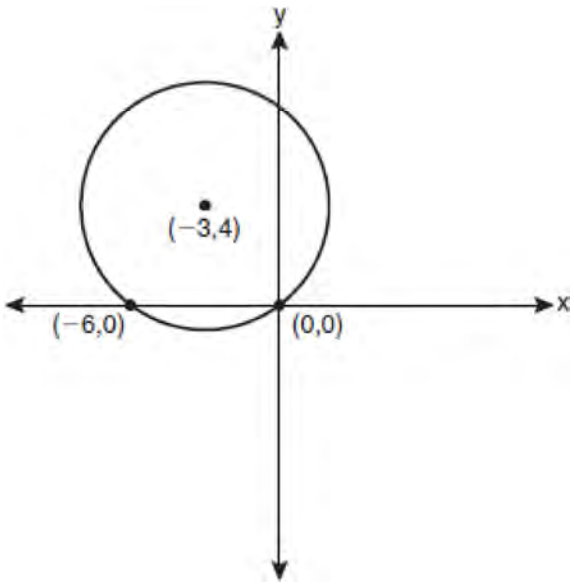


Write an equation that represents the circle.

271 Write an equation of the circle shown in the diagram below.



272 Write an equation of the circle shown in the graph below.



273 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 $(x+1)^2 + (y+3)^2 = 10$

Algebra 2/Trigonometry Regents Exam Questions by Performance Indicator: Topic
Answer Section

1 ANS: 4 PTS: 2 REF: 011127a2 STA: A2.S.1
TOP: Analysis of Data

2 ANS: 4 PTS: 2 REF: 061101a2 STA: A2.S.1
TOP: Analysis of Data

3 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

4 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

5 ANS: 4 PTS: 2 REF: 011201a2 STA: A2.S.2
TOP: Analysis of Data

6 ANS: 4 PTS: 2 REF: 061124a2 STA: A2.S.3
TOP: Average Known with Missing Data

7 ANS: 4

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

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

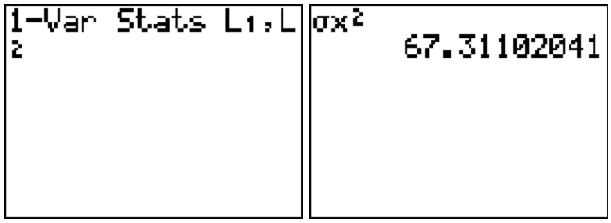
$$4k+36=2k+44$$

$$2k=8$$

$$k=4$$

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

8 ANS: 3



PTS: 2 REF: fall0924a2 STA: A2.S.4 TOP: Dispersion
KEY: variance

9 ANS:
7.4

PTS: 2 REF: 061029a2 STA: A2.S.4 TOP: Dispersion
KEY: basic, group frequency distributions

10 ANS:
$\sigma_x = 14.9$. $\bar{x} = 40$. There are 8 scores between 25.1 and 54.9.

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

11 ANS: 3 PTS: 2 REF: 061127a2 STA: A2.S.6
TOP: Regression

12 ANS:
$y = 180.377(0.954)^x$

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

13 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

14 ANS:
$y = 10.596(1.586)^x$

PTS: 2 REF: 081031a2 STA: A2.S.7 TOP: Exponential Regression

15 ANS:
$y = 2.001x^{2.298}$, 1,009. $y = 2.001(15)^{2.298} \approx 1009$

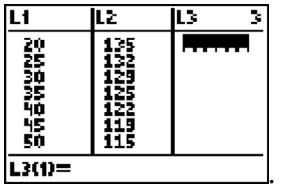
PTS: 4 REF: fall0938a2 STA: A2.S.7 TOP: Power Regression

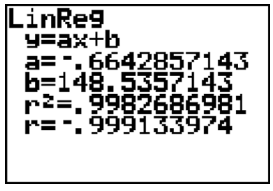
16 ANS: 2 PTS: 2 REF: 061021a2 STA: A2.S.8
TOP: Correlation Coefficient

17 ANS: 1
(4) shows the strongest linear relationship, but if $r < 0$, $b < 0$.

PTS: 2 REF: 011223a2 STA: A2.S.8 TOP: Correlation Coefficient

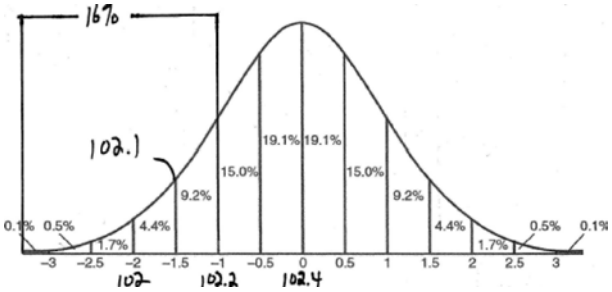
18 ANS: 1





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

19 ANS: 1



PTS: 2 REF: fall0915a2 STA: A2.S.5 TOP: Normal Distributions
KEY: interval

20 ANS: 3

$34.1\% + 19.1\% = 53.2\%$

PTS: 2 REF: 011212a2 STA: A2.S.5 TOP: Normal Distributions
KEY: probability

21 ANS: 3

$68\% \times 50 = 34$

PTS: 2 REF: 081013a2 STA: A2.S.5 TOP: Normal Distributions
KEY: predict

22 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

23 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

24 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

25 ANS: 4 PTS: 2 REF: fall0925a2 STA: A2.S.10
TOP: Permutations

26 ANS:

39,916,800. $\frac{{}_{12}P_{12}}{3! \cdot 2!} = \frac{479,001,600}{12} = 39,916,800$

PTS: 2 REF: 081035a2 STA: A2.S.10 TOP: Permutations

27 ANS:

No. TENNESSEE: $\frac{{}_9P_9}{4!\cdot 2!\cdot 2!} = \frac{362,880}{96} = 3,780$. VERMONT: ${}_7P_7 = 5,040$

PTS: 4 REF: 061038a2 STA: A2.S.10 TOP: Permutations

28 ANS: 1

${}_{10}C_4 = 210$

PTS: 2 REF: 061113a2 STA: A2.S.11 TOP: Combinations

29 ANS: 2

${}_{15}C_8 = 6,435$

PTS: 2 REF: 081012a2 STA: A2.S.11 TOP: Combinations

30 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

31 ANS:

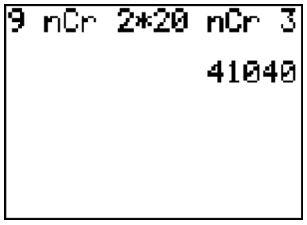
${}_{25}C_{20} = 53,130$

PTS: 2 REF: 011232a2 STA: A2.S.11 TOP: Combinations

32 ANS: 3 PTS: 2 REF: 061007a2 STA: A2.S.9
TOP: Differentiating Permutations and Combinations

33 ANS: 1 PTS: 2 REF: 011117a2 STA: A2.S.9
TOP: Differentiating Permutations and Combinations

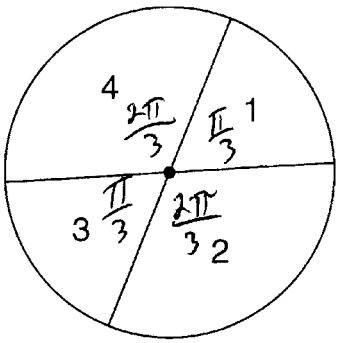
34 ANS:



41,040.

PTS: 2 REF: fall0935a2 STA: A2.S.12 TOP: Sample Space

35 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

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

37 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

38 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

39 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

40 ANS:

0.468. ${}_8C_6\left(\frac{2}{3}\right)^6\left(\frac{1}{3}\right)^2\approx 0.27313$. ${}_8C_7\left(\frac{2}{3}\right)^7\left(\frac{1}{3}\right)^1\approx 0.15607$. ${}_8C_8\left(\frac{2}{3}\right)^8\left(\frac{1}{3}\right)^0\approx 0.03902$.

PTS: 4 REF: 011138a2 STA: A2.S.15 TOP: Binomial Probability
KEY: at least or at most

41 ANS:

$\frac{51}{243}$. ${}_5C_3\left(\frac{1}{3}\right)^3\left(\frac{2}{3}\right)^2 = \frac{40}{243}$

${}_5C_4\left(\frac{1}{3}\right)^4\left(\frac{2}{3}\right)^1 = \frac{10}{243}$

${}_5C_3\left(\frac{1}{3}\right)^5\left(\frac{2}{3}\right)^0 = \frac{1}{243}$

PTS: 4 REF: 061138a2 STA: A2.S.15 TOP: Binomial Probability
KEY: at least or at most

42 ANS: 1

$4a + 6 = 4a - 10$. $4a + 6 = -4a + 10$. $\left|4\left(\frac{1}{2}\right) + 6\right| - 4\left(\frac{1}{2}\right) = -10$

$6 \neq -10$ $8a = 4$ $8 - 2 \neq -10$

$a = \frac{4}{8} = \frac{1}{2}$

PTS: 2 REF: 011106a2 STA: A2.A.1 TOP: Absolute Value Equations

43 ANS: 1

$6x - 7 \leq 5$ $6x - 7 \geq -5$

$6x \leq 12$ $6x \geq 2$

$x \leq 2$ $x \geq \frac{1}{3}$

PTS: 2 REF: fall0905a2 STA: A2.A.1 TOP: Absolute Value Inequalities
KEY: graph

44 ANS: 3

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

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

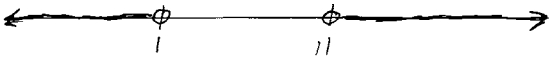
$4x > 8$ $4x < 2$

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

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

45 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

46 ANS: 2

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

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

47 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

48 ANS: 3

$\frac{-b}{a} = \frac{-6}{2} = -3$. $\frac{c}{a} = \frac{4}{2} = 2$

PTS: 2 REF: 011121a2 STA: A2.A.21 TOP: Roots of Quadratics
KEY: basic

49 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

50 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

51 ANS:

$x^2 - 6x - 27 = 0$, $\frac{-b}{a} = 6$. $\frac{c}{a} = -27$. If $a = 1$ then $b = -6$ and $c = -27$

PTS: 4 REF: 061130a2 STA: A2.A.21 TOP: Roots of Quadratics
KEY: basic

52 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

53 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

54 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

55 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

56 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

57 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: Quadratic Formula

58 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: Quadratic Formula

59 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

60 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

61 ANS:

$b^2 - 4ac = 0$

$k^2 - 4(1)(4) = 0$

$k^2 - 16 = 0$

$(k + 4)(k - 4) = 0$

$k = \pm 4$

PTS: 2 REF: 061028a2 STA: A2.A.2 TOP: Using the Discriminant
KEY: determine equation given nature of roots

62 ANS: 2 PTS: 2 REF: 061122a2 STA: A2.A.24
TOP: Completing the Square

63 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

64 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

65 ANS: 1

$y \geq x^2 - x - 6$

$y \geq (x - 3)(x + 2)$

PTS: 2 REF: 061017a2 STA: A2.A.4 TOP: Quadratic Inequalities
KEY: two variables

66 ANS: 3

$x^2 - 3x - 10 > 0$ or

$(x - 5)(x + 2) > 0$ $x - 5 < 0$ and $x + 2 < 0$

$x - 5 > 0$ and $x + 2 > 0$ $x < 5$ and $x < -2$

$x > 5$ and $x > -2$ $x < -2$

$x > 5$

PTS: 2 REF: 011115a2 STA: A2.A.4 TOP: Quadratic Inequalities
KEY: one variable

67 ANS:

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

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

$x > 5$ $x < -1$

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

68 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

69 ANS:

$\left(-\frac{9}{2}, \frac{1}{2}\right)$ and $\left(\frac{1}{2}, \frac{11}{2}\right)$. $y = x + 5$. $4x^2 + 17x - 4 = x + 5$

$y = 4x^2 + 17x - 4$ $4x^2 + 16x - 9 = 0$

$(2x + 9)(2x - 1) = 0$

$x = -\frac{9}{2}$ and $x = \frac{1}{2}$

$y = -\frac{9}{2} + 5 = \frac{1}{2}$ and $y = \frac{1}{2} + 5 = \frac{11}{2}$

PTS: 6 REF: 061139a2 STA: A2.A.3 TOP: Quadratic-Linear Systems
KEY: equations

70 ANS: 2 PTS: 2 REF: 011114a2 STA: A2.N.3
TOP: Operations with Polynomials

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

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

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

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

73 ANS:

$\frac{4}{9}x^2 - \frac{4}{3}x + 1$. $\left(\frac{2}{3}x - 1\right)^2 = \left(\frac{2}{3}x - 1\right)\left(\frac{2}{3}x - 1\right) = \frac{4}{9}x^2 - \frac{2}{3}x - \frac{2}{3}x + 1 = \frac{4}{9}x^2 - \frac{4}{3}x + 1$

PTS: 2 REF: 081034a2 STA: A2.N.3 TOP: Operations with Polynomials

74 ANS:

$6y^3 - \frac{37}{10}y^2 - \frac{1}{5}y$. $\left(\frac{1}{2}y^2 - \frac{1}{3}y\right)\left(12y + \frac{3}{5}\right) = 6y^3 + \frac{3}{10}y^2 - 4y^2 - \frac{1}{5}y = 6y^3 - \frac{37}{10}y^2 - \frac{1}{5}y$

PTS: 2 REF: 061128a2 STA: A2.N.3 TOP: Operations with Polynomials

75 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

76 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

77 ANS: 1 PTS: 2 REF: fall0914a2 STA: A2.A.9
TOP: Negative and Fractional Exponents

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

79 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

80 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

81 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

82 ANS:

$$e^{3\ln 2} = e^{\ln 2^3} = e^{\ln 8} = 8$$

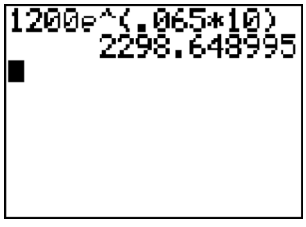
PTS: 2 REF: 061131a2 STA: A2.A.12 TOP: Evaluating Exponential Expressions

83 ANS:

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

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

84 ANS:



2,298.65.

PTS: 2 REF: fall0932a2 STA: A2.A.12 TOP: Evaluating Exponential Expressions

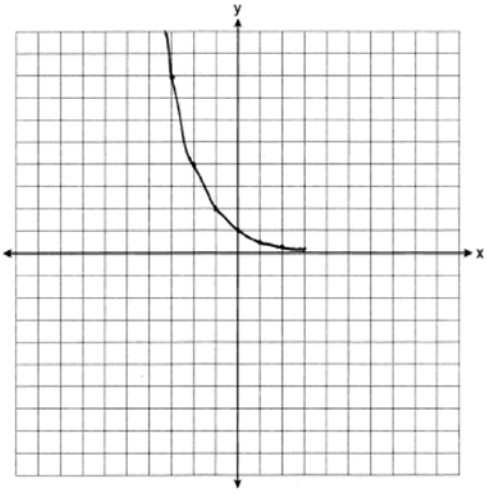
85 ANS: 2

$8^2 = 64$

PTS: 2 REF: fall0909a2 STA: A2.A.18 TOP: Evaluating Logarithmic Expressions

86 ANS: 4 PTS: 2 REF: 011124a2 STA: A2.A.18
TOP: Evaluating Logarithmic Expressions

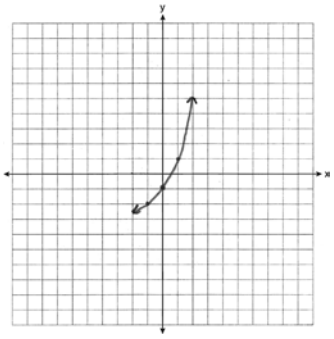
87 ANS:



$y = 0$

PTS: 2 REF: 061031a2 STA: A2.A.53 TOP: Graphing Exponential Functions

88 ANS:



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

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

90 ANS: 2

$f^{-1}(x) = \log_4 x$

PTS: 2 REF: fall0916a2 STA: A2.A.54 TOP: Graphing Logarithmic Functions

91 ANS: 1

$2\log x - (3\log y + \log z) = \log x^2 - \log y^3 - \log z = \log \frac{x^2}{y^3 z}$

PTS: 2 REF: 061010a2 STA: A2.A.19 TOP: Properties of Logarithms

92 ANS: 4 PTS: 2 REF: 061120a2 STA: A2.A.19
TOP: Properties of Logarithms KEY: splitting logs

93 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

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

95 ANS: 3

$x = 5^4 = 625$

PTS: 2 REF: 061106a2 STA: A2.A.28 TOP: Logarithmic Equations
KEY: basic

96 ANS: 4

$2\log_4(5x) = 3$

$\log_4(5x) = \frac{3}{2}$

$5x = 4^{\frac{3}{2}}$

$5x = 8$

$x = \frac{8}{5}$

PTS: 2 REF: fall0921a2 STA: A2.A.28 TOP: Logarithmic Equations
KEY: advanced

97 ANS:

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

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

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

98 ANS:

$x = -\frac{1}{3}, -1$ $\log_{x+3} \frac{x^3 + x - 2}{x} = 2$

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

$$\frac{x^3 + x - 2}{x} = x^2 + 6x + 9$$

$$x^3 + x - 2 = x^3 + 6x^2 + 9x$$

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

$$0 = 3x^2 + 4x + 1$$

$$0 = (3x+1)(x+1)$$

$$x = -\frac{1}{3}, -1$$

PTS: 6 REF: 081039a2 STA: A2.A.28 TOP: Logarithmic Equations
KEY: basic

99 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

100 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

101 ANS: 3

$$75000 = 25000e^{.0475t}$$

$$3 = e^{.0475t}$$

$$\ln 3 = \ln e^{.0475t}$$

$$\frac{\ln 3}{.0475} = \frac{.0475t \cdot \ln e}{.0475}$$

$$23.1 \approx t$$

PTS: 2 REF: 061117a2 STA: A2.A.6 TOP: Exponential Growth

102 ANS: 4

$$9^{3x+1} = 27^{x+2} \quad .$$

$$(3^2)^{3x+1} = (3^3)^{x+2}$$

$$3^{6x+2} = 3^{3x+6}$$

$$6x + 2 = 3x + 6$$

$$3x = 4$$

$$x = \frac{4}{3}$$

PTS: 2 REF: 081008a2 STA: A2.A.27 TOP: Exponential Equations
KEY: common base not shown

103 ANS: 2

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

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

$$2^{4x+10} = 2^{9x}$$

$$4x + 10 = 9x$$

$$10 = 5x$$

$$2 = x$$

PTS: 2 REF: 061105a2 STA: A2.A.27 TOP: Exponential Equations
KEY: common base not shown

104 ANS: 3

$4^{x^2+4x} = 2^{-6}$. $2x^2 + 8x = -6$

$(2^2)^{x^2+4x} = 2^{-6}$ $2x^2 + 8x + 6 = 0$

$2^{2x^2+8x} = 2^{-6}$ $x^2 + 4x + 3 = 0$

$(x+3)(x+1) = 0$

$x = -3 \; x = -1$

PTS: 2 REF: 061015a2 STA: A2.A.27 TOP: Exponential Equations
KEY: common base shown

105 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

106 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

107 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

108 ANS: 1

${}_9C_3a^6(-4b)^3 = -5376a^6b^3$

PTS: 2 REF: 061126a2 STA: A2.A.36 TOP: Binomial Expansions

109 ANS: 3

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

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

110 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

111 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

112 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

113 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

114 ANS:

$\pm\frac{3}{2}, -\frac{1}{2}$. $8x^3 + 4x^2 - 18x - 9 = 0$

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

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

$4x^2 - 9 = 0$ or $2x + 1 = 0$

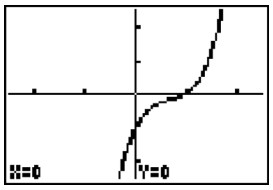
$(2x + 3)(2x - 3) = 0$ $x = -\frac{1}{2}$

$x = \pm\frac{3}{2}$

PTS: 4 REF: fall0937a2 STA: A2.A.26 TOP: Solving Polynomial Equations

115 ANS: 4 PTS: 2 REF: 061005a2 STA: A2.A.50
TOP: Solving Polynomial Equations
116 ANS: 2
The roots are $-1, 2, 3$.

PTS: 2 REF: 081023a2 STA: A2.A.50 TOP: Solving Polynomial Equations
117 ANS: 4



PTS: 2 REF: 061222a2 STA: A2.A.50 TOP: Solving Polynomial Equations
118 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
119 ANS:
$-\frac{a^2 b^3}{4}$

PTS: 2 REF: 011231a2 STA: A2.A.13 TOP: Simplifying Radicals
KEY: index > 2
120 ANS: 4
$(3+\sqrt{5})(3-\sqrt{5}) = 9-\sqrt{25} = 4$

PTS: 2 REF: 081001a2 STA: A2.N.2 TOP: Operations with Radicals
121 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
122 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
123 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

124 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

125 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

126 ANS:

$$\frac{5(3+\sqrt{2})}{7} \cdot \frac{5}{3-\sqrt{2}} \times \frac{3+\sqrt{2}}{3+\sqrt{2}} = \frac{5(3+\sqrt{2})}{9-2} = \frac{5(3+\sqrt{2})}{7}$$

PTS: 2 REF: fall0928a2 STA: A2.N.5 TOP: Rationalizing Denominators

127 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

128 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

129 ANS: 1 PTS: 2 REF: 061018a2 STA: A2.A.22
TOP: Solving Radicals KEY: extraneous solutions

130 ANS: 3

$3x+16=(x+2)^2$. -4 is an extraneous solution.

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

$0=x^2+x-12$

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

$x=-4 \quad x=3$

PTS: 2 REF: 061121a2 STA: A2.A.22 TOP: Solving Radicals
KEY: extraneous solutions

131 ANS: 1

$5x + 29 = (x + 3)^2$. $(-5) + 3$ 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

132 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

133 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

134 ANS: 2 PTS: 2 REF: 061011a2 STA: A2.A.10
TOP: Fractional Exponents as Radicals

135 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

136 ANS: 3

$\sqrt{-300} = \sqrt{100}\sqrt{-1}\sqrt{3}$

PTS: 2 REF: 061006a2 STA: A2.N.6 TOP: Square Roots of Negative Numbers

137 ANS: 1 PTS: 2 REF: 061019a2 STA: A2.N.7
TOP: Imaginary Numbers

138 ANS: 1

$2i^2 + 3i^3 = 2(-1) + 3(-i) = -2 - 3i$

PTS: 2 REF: 081004a2 STA: A2.N.7 TOP: Imaginary Numbers

139 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

140 ANS: 2 PTS: 2 REF: 081024a2 STA: A2.N.8
TOP: Conjugates of Complex Numbers

141 ANS: 4 PTS: 2 REF: 011111a2 STA: A2.N.8
TOP: Conjugates of Complex Numbers

142 ANS: 2 PTS: 2 REF: 011213a2 STA: A2.N.8
TOP: Conjugates of Complex Numbers

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

144 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

145 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

146 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

147 ANS:

no solution. $\frac{4x}{x-3} = 2 + \frac{12}{x-3}$

$$\frac{4x-12}{x-3} = 2$$

$$\frac{4(x-3)}{x-3} = 2$$

$$4 \neq 2$$

PTS: 2 REF: fall0930a2 STA: A2.A.23 TOP: Solving Rationals
KEY: rational solutions

148 ANS:

$\frac{1}{3}$ $\frac{1}{x+3} - \frac{2}{3-x} = \frac{4}{x^2-9}$

$$\frac{1}{x+3} + \frac{2}{x-3} = \frac{4}{x^2-9}$$

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

$$x-3+2x+6 = 4$$

$$3x = 1$$

$$x = \frac{1}{3}$$

PTS: 4 REF: 081036a2 STA: A2.A.23 TOP: Solving Rationals
KEY: rational solutions

149 ANS: 2

$$\frac{\frac{x}{4} - \frac{1}{x}}{\frac{1}{2x} + \frac{1}{4}} = \frac{\frac{x^2-4}{4x}}{\frac{2x+4}{8x}} = \frac{(x+2)(x-2)}{4x} \times \frac{8x}{2(x+2)} = x-2$$

PTS: 2 REF: fall0920a2 STA: A2.A.17 TOP: Complex Fractions

150 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

151 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

152 ANS:

$12 \cdot 6 = 9w$

$8 = w$

PTS: 2 REF: 011130a2 STA: A2.A.5 TOP: Inverse Variation

153 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

154 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

155 ANS: 3 PTS: 2 REF: 011119a2 STA: A2.A.52
TOP: Families of Functions

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

157 ANS: 1 PTS: 2 REF: 061004a2 STA: A2.A.52
TOP: Identifying the Equation of a Graph

158 ANS: 2 PTS: 2 REF: 061108a2 STA: A2.A.52
TOP: Identifying the Equation of a Graph

159 ANS: 4 PTS: 2 REF: fall0908a2 STA: A2.A.38
TOP: Defining Functions KEY: graphs

160 ANS: 4 PTS: 2 REF: 011101a2 STA: A2.A.38
TOP: Defining Functions KEY: graphs

161 ANS: 3 PTS: 2 REF: 061114a2 STA: A2.A.38
TOP: Defining Functions KEY: graphs

162 ANS: 1 PTS: 2 REF: 061013a2 STA: A2.A.38
TOP: Defining Functions

163 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
164 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
165 ANS: 2 PTS: 2 REF: 011225a2 STA: A2.A.43
TOP: Defining Functions
166 ANS: 2 PTS: 2 REF: 061218a2 STA: A2.A.43
TOP: Defining Functions
167 ANS: 3 PTS: 2 REF: fall0923a2 STA: A2.A.39
TOP: Domain and Range KEY: real domain
168 ANS: 4 PTS: 2 REF: 061112a2 STA: A2.A.39
TOP: Domain and Range KEY: real domain
169 ANS: 2 PTS: 2 REF: 011222a2 STA: A2.A.39
TOP: Domain and Range KEY: real domain
170 ANS: 1 PTS: 2 REF: 061202a2 STA: A2.A.51
TOP: Domain and Range
171 ANS: 2 PTS: 2 REF: 081003a2 STA: A2.A.51
TOP: Domain and Range
172 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
173 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
174 ANS: 2
$6(x^2 - 5) = 6x^2 - 30$

PTS: 2 REF: 011109a2 STA: A2.A.42 TOP: Compositions of Functions
KEY: variables
175 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

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

177 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

178 ANS: 3 PTS: 2 REF: 081027a2 STA: A2.A.44
TOP: Inverse of Functions KEY: equations

179 ANS:

$y = x^2 - 6$. $f^{-1}(x)$ 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

180 ANS: 2 PTS: 2 REF: fall0926a2 STA: A2.A.46
TOP: Transformations with Functions and Relations

181 ANS: 1 PTS: 2 REF: 081022a2 STA: A2.A.46
TOP: Transformations with Functions and Relations

182 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

183 ANS: 4

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

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

184 ANS: 4 PTS: 2 REF: 061026a2 STA: A2.A.29
TOP: Sequences

185 ANS: 3 PTS: 2 REF: 061001a2 STA: A2.A.30
TOP: Sequences

186 ANS: 3 PTS: 2 REF: 011110a2 STA: A2.A.30
TOP: Sequences

187 ANS: 3

$27r^{4-1} = 64$

$$r^3 = \frac{64}{27}$$

$$r = \frac{4}{3}$$

PTS: 2 REF: 081025a2 STA: A2.A.31 TOP: Sequences

188 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

189 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

190 ANS:

$a_1 = 3.\ a_2 = 2(3) - 1 = 5.\ a_3 = 2(5) - 1 = 9.$

PTS: 2 REF: 061233a2 STA: A2.A.33 TOP: Recursive Sequences

191 ANS:

$-3, -5, -8, -12$

PTS: 2 REF: fall0934a2 STA: A2.A.33 TOP: Recursive Sequences

192 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

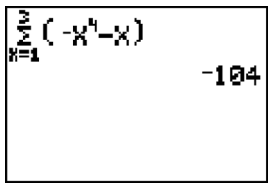
193 ANS: 3

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

$2 \times 12 = 24$

PTS: 2 REF: fall0911a2 STA: A2.N.10 TOP: Sigma Notation
KEY: basic

194 ANS:



−104.

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

195 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

196 ANS: 1 PTS: 2 REF: 061025a2 STA: A2.A.34
TOP: Sigma Notation

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

198 ANS:

$\sum_{n=1}^{15} 7n$

PTS: 2 REF: 081029a2 STA: A2.A.34 TOP: Sigma Notation

199 ANS: 4

$S_n = \frac{n}{2}[2a+(n-1)d] = \frac{21}{2}[2(18)+(21-1)2] = 798$

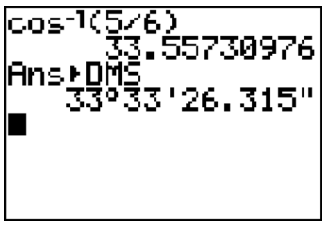
PTS: 2 REF: 061103a2 STA: A2.A.35 TOP: Series
KEY: arithmetic

200 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

201 ANS: 1



$\cos K = \frac{5}{6}$

$K = \cos^{-1}\frac{5}{6}$

$K \approx 33°33'$

PTS: 2 REF: 061023a2 STA: A2.A.55 TOP: Trigonometric Ratios

202 ANS: 2 PTS: 2 REF: 081010a2 STA: A2.A.55 TOP: Trigonometric Ratios

203 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

204 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

205 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

206 ANS: 1

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

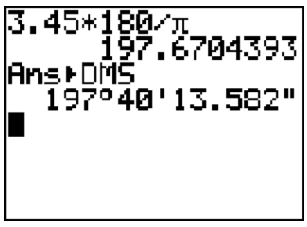
PTS: 2 REF: 011220a2 STA: A2.M.2 TOP: Radian Measure
KEY: degrees

207 ANS: 2

$\frac{11\pi}{12} \cdot \frac{180}{\pi} = 165$

PTS: 2 REF: 061002a2 STA: A2.M.2 TOP: Radian Measure
KEY: degrees

208 ANS:



197°40’. $3.45 \times \frac{180}{\pi} \approx 197°40'$.

PTS: 2 REF: fall0931a2 STA: A2.M.2 TOP: Radian Measure
KEY: degrees

209 ANS:

$2.5 \cdot \frac{180}{\pi} \approx 143.2°$

PTS: 2 REF: 011129a2 STA: A2.M.2 TOP: Radian Measure
KEY: degrees

210 ANS:

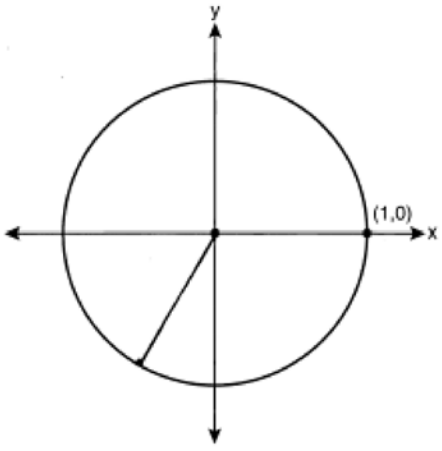
$216\left(\frac{\pi}{180}\right) \approx 3.8$

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

211 ANS: 4 PTS: 2 REF: 081005a2 STA: A2.A.60
TOP: Unit Circle

212 ANS: 4 PTS: 2 REF: 061206a2 STA: A2.A.60
TOP: Unit Circle

213 ANS:



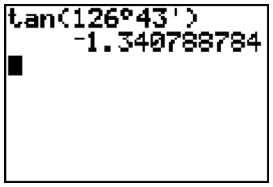
$-\frac{\sqrt{3}}{2}$

PTS: 2 REF: 061033a2 STA: A2.A.60 TOP: Unit Circle

214 ANS:
$\frac{\sqrt{13}}{2}$. $\sin\theta = \frac{y}{\sqrt{x^2+y^2}} = \frac{2}{\sqrt{(-3)^2+2^2}} = \frac{2}{\sqrt{13}}$. $\csc\theta = \frac{\sqrt{13}}{2}$.

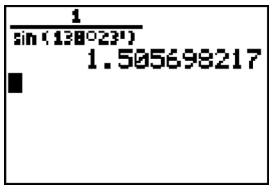
PTS: 2 REF: fall0933a2 STA: A2.A.62 TOP: Determining Trigonometric Functions

215 ANS: 2



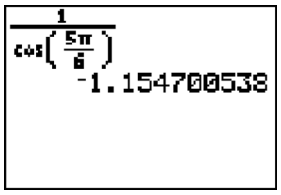
PTS: 2 REF: 061115a2 STA: A2.A.66 TOP: Determining Trigonometric Functions

216 ANS: 4



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

217 ANS: 1



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

218 ANS: 3 PTS: 2 REF: 081007a2 STA: A2.A.64
TOP: Using Inverse Trigonometric Functions KEY: basic

219 ANS: 3 PTS: 2 REF: 011104a2 STA: A2.A.64
TOP: Using Inverse Trigonometric Functions KEY: unit circle

220 ANS: 1 PTS: 2 REF: 011112a2 STA: A2.A.64
TOP: Using Inverse Trigonometric Functions KEY: advanced

221 ANS: 2
$\cos(-305° + 360°) = \cos(55°)$

PTS: 2 REF: 061104a2 STA: A2.A.57 TOP: Reference Angles

222 ANS: 4
$s = \theta r = 2 \cdot 4 = 8$

PTS: 2 REF: fall0922a2 STA: A2.A.61 TOP: Arc Length
KEY: arc length

223 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

224 ANS: 3

Cofunctions tangent and cotangent are complementary

PTS: 2 REF: 061014a2 STA: A2.A.58 TOP: Cofunction Trigonometric Relationships

225 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

226 ANS:

$\cos\theta \cdot \frac{1}{\cos\theta} - \cos^2\theta = 1 - \cos^2\theta = \sin^2\theta$

PTS: 2 REF: 061230a2 STA: A2.A.58 TOP: Reciprocal Trigonometric Relationships

227 ANS:

$\frac{2\sqrt{3}}{3}$. If $\sin 60 = \frac{\sqrt{3}}{2}$, then $\csc 60 = \frac{2}{\sqrt{3}} \cdot \frac{\sqrt{3}}{\sqrt{3}} = \frac{2\sqrt{3}}{3}$

PTS: 2 REF: 011235a2 STA: A2.A.59 TOP: Reciprocal Trigonometric Relationships

228 ANS: 2 PTS: 2 REF: 011208a2 STA: A2.A.67
TOP: Proving Trigonometric Identities

229 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

230 ANS: 3 PTS: 2 REF: fall0910a2 STA: A2.A.76
TOP: Angle Sum and Difference Identities KEY: simplifying

231 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

232 ANS:

$\frac{23}{2}$ $\cos^2 B + \sin^2 B = 1$ $\tan B = \frac{\sin B}{\cos B} = \frac{\frac{5}{\sqrt{41}}}{\frac{4}{\sqrt{41}}} = \frac{5}{4}$ $\tan(A+B) = \frac{\frac{2}{3}+\frac{5}{4}}{1-\left(\frac{2}{3}\right)\left(\frac{5}{4}\right)} = \frac{\frac{8+15}{12}}{\frac{12}{12}-\frac{10}{12}} = \frac{\frac{23}{12}}{\frac{2}{12}} = \frac{23}{2}$

$\cos^2 B + \left(\frac{5}{\sqrt{41}}\right)^2 = 1$

$\cos^2 B + \frac{25}{41} = \frac{41}{41}$

$\cos^2 B = \frac{16}{41}$

$\cos B = \frac{4}{\sqrt{41}}$

PTS: 4 REF: 081037a2 STA: A2.A.76 TOP: Angle Sum and Difference Identities
KEY: evaluating

233 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

234 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

235 ANS: 3

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

$\cos^2 A = \frac{5}{9}$ $= 2\left(\frac{2}{3}\right)\left(\frac{\sqrt{5}}{3}\right)$

$\cos A = +\frac{\sqrt{5}}{3}$, sin A is acute. $= \frac{4\sqrt{5}}{9}$

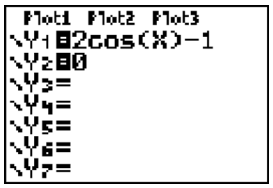
PTS: 2 REF: 011107a2 STA: A2.A.77 TOP: Double Angle Identities
KEY: evaluating

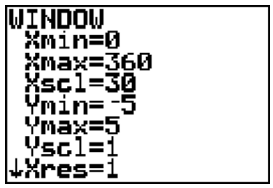
236 ANS: 1

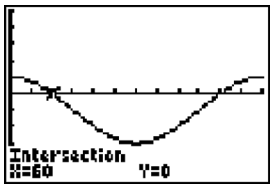
If $\sin x = 0.8$, then $\cos x = 0.6$. $\tan\frac{1}{2}x = \sqrt{\frac{1-0.6}{1+0.6}} = \sqrt{\frac{0.4}{1.6}} = 0.5$.

PTS: 2 REF: 061220a2 STA: A2.A.77 TOP: Half Angle Identities

237 ANS: 4







$2\cos\theta = 1$

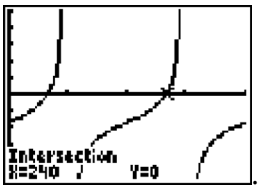
$\cos\theta = \frac{1}{2}$

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

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

238 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

239 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

240 ANS:
0, 60, 180, 300. $\sin 2\theta = \sin \theta$

$$\sin 2\theta - \sin \theta = 0$$

$$2\sin \theta \cos \theta - \sin \theta = 0$$

$$\sin \theta(2\cos \theta - 1) = 0$$

$$\sin \theta = 0 \quad 2\cos \theta - 1 = 0$$

$$\theta = 0, 180 \quad \cos \theta = \frac{1}{2}$$

$$\theta = 60, 300$$

PTS: 4 REF: 061037a2 STA: A2.A.68 TOP: Trigonometric Equations
KEY: double angle identities

Algebra 2/Trigonometry Regents Exam Questions by Performance Indicator: Topic
Answer Section

241 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

242 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

243 ANS: 4

$\frac{2\pi}{b} = 30$

$b = \frac{\pi}{15}$

PTS: 2 REF: 011227a2 STA: A2.A.72
TOP: Identifying the Equation of a Trigonometric Graph

244 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

245 ANS: 3 PTS: 2 REF: fall0913a2 STA: A2.A.65
TOP: Graphing Trigonometric Functions

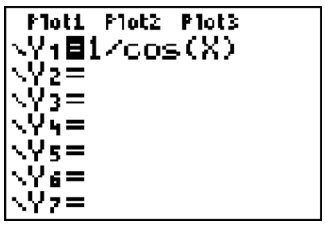
246 ANS: 3 PTS: 2 REF: 061119a2 STA: A2.A.65
TOP: Graphing Trigonometric Functions

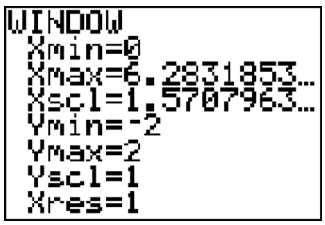
247 ANS: 3

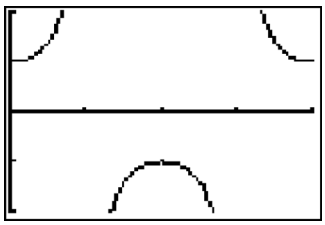
$\text{period} = \frac{2\pi}{b} = \frac{2\pi}{3\pi} = \frac{2}{3}$

PTS: 2 REF: 081026a2 STA: A2.A.70 TOP: Graphing Trigonometric Functions
KEY: recognize

248 ANS: 3

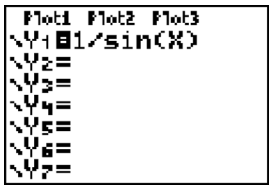


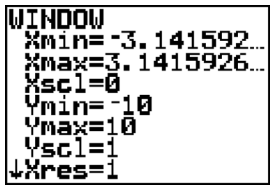


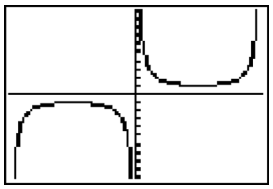


PTS: 2 REF: 061020a2 STA: A2.A.71 TOP: Graphing Trigonometric Functions

249 ANS: 1

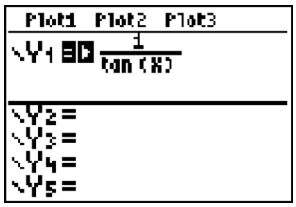


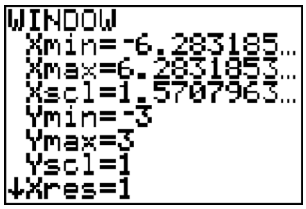


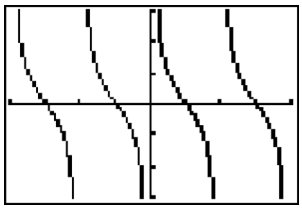


PTS: 2 REF: 011123a2 STA: A2.A.71 TOP: Graphing Trigonometric Functions

250 ANS: 3







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

251 ANS: 3 PTS: 2 REF: 061022a2 STA: A2.A.63
TOP: Domain and Range

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

253 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

254 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

255 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

256 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

257 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

258 ANS:
88. $\frac{100}{\sin 33} = \frac{x}{\sin 32}$. $\sin 66 \approx \frac{T}{97.3}$

$x \approx 97.3$ $t \approx 88$

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

259 ANS:
$\frac{12}{\sin 32} = \frac{10}{\sin B}$. $C \approx 180 - (32 + 26.2) \approx 121.8$. $\frac{12}{\sin 32} = \frac{c}{\sin 121.8}$

$B = \sin^{-1}\frac{10\sin 32}{12} \approx 26.2$ $c = \frac{12\sin 121.8}{\sin 32} \approx 19.2$

PTS: 4 REF: 011137a2 STA: A2.A.73 TOP: Law of Sines
KEY: basic

260 ANS: 2
$\frac{10}{\sin 35} = \frac{13}{\sin B}$. $35 + 48 < 180$

$B \approx 48, 132$ $35 + 132 < 180$

PTS: 2 REF: 011113a2 STA: A2.A.75 TOP: Law of Sines - The Ambiguous Case

261 ANS: 1
$\frac{9}{\sin A} = \frac{10}{\sin 70}$. $58° + 70°$ is possible. $122° + 70°$ is not possible.

$A = 58$

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

262 ANS: 3
$\frac{59.2}{\sin 74} = \frac{60.3}{\sin C}$ $180 - 78.3 = 101.7$

$C \approx 78.3$

PTS: 2 REF: 081006a2 STA: A2.A.75 TOP: Law of Sines - The Ambiguous Case

263 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

264 ANS: 1

$$13^2 = 15^2 + 14^2 - 2(15)(14)\cos C$$

$$169 = 421 - 420\cos C$$

$$-252 = -420\cos C$$

$$\frac{252}{420} = \cos C$$

$$53 \approx C$$

PTS: 2 REF: 061110a2 STA: A2.A.73 TOP: Law of Cosines
KEY: find angle

265 ANS: 4

$$7^2 = 3^2 + 5^2 - 2(3)(5)\cos A$$

$$49 = 34 - 30\cos A$$

$$15 = -30\cos A$$

$$-\frac{1}{2} = \cos A$$

$$120 = \cos A$$

PTS: 2 REF: 081017a2 STA: A2.A.73 TOP: Law of Cosines
KEY: angle, without calculator

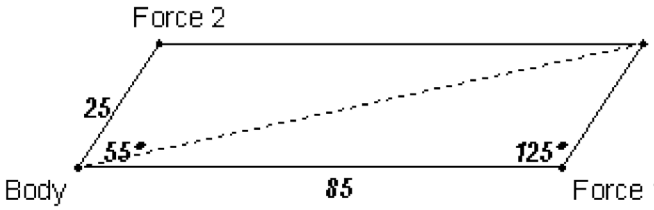
266 ANS:

33. $a = \sqrt{10^2 + 6^2 - 2(10)(6)\cos 80} \approx 10.7$. $\angle C$ is opposite the shortest side. $\frac{6}{\sin C} = \frac{10.7}{\sin 80}$

$$C \approx 33$$

PTS: 6 REF: 061039a2 STA: A2.A.73 TOP: Law of Cosines
KEY: advanced

267 ANS:



101.43, 12. $r^2 = 25^2 + 85^2 - 2(25)(85)\cos 125.$

$r^2 \approx 10287.7$

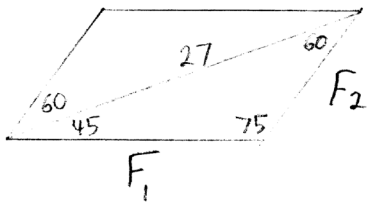
$r \approx 101.43$

$\frac{2.5}{\sin x} = \frac{101.43}{\sin 125}$

$x \approx 12$

PTS: 6 REF: fall0939a2 STA: A2.A.73 TOP: Vectors

268 ANS:



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

$F_1 \approx 24$ $F_1 \approx 20$

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

269 ANS: 2 PTS: 2 REF: 011126a2 STA: A2.A.49 TOP: Equations of Circles

270 ANS:

$(x+5)^2 + (y-3)^2 = 32$

PTS: 2 REF: 081033a2 STA: A2.A.49 TOP: Writing Equations of Circles

271 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

272 ANS:

$(x+3)^2 + (y-4)^2 = 25$

PTS: 2 REF: fall0929a2 STA: A2.A.49 TOP: Writing Equations of Circles

273 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