JEFFERSON MATH PROJECT REGENTS BY PERFORMANCE INDICATOR: TOPIC

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

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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.

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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: CENTRAL TENDENCY

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

A2.S.4: DISPERSION

7 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*.

8 The table below shows the first-quarter averages for Mr. Harper's statistics class.

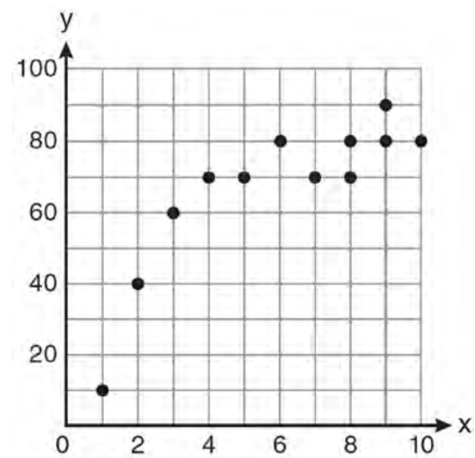
Statistics Class Averages

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

A2.S.6-7: REGRESSION

9 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

10 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.

11 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.

12 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.*

A2.S.8: CORRELATION COEFFICIENT

13 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

14 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
$y = a + bx$
$a = -2.9$
$b = 24.1$
$r = -.8924$

A2.S.5: NORMAL DISTRIBUTIONS

15 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

16 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%

17 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 16^{th} percentile
2 between the 50^{th} and 84^{th} percentiles
3 between the 16^{th} and 50^{th} percentiles
4 above the 84^{th} percentile

18 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.

19 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

20 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

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

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

23 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

24 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

25 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

26 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

27 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 ${}_{20}P_3$

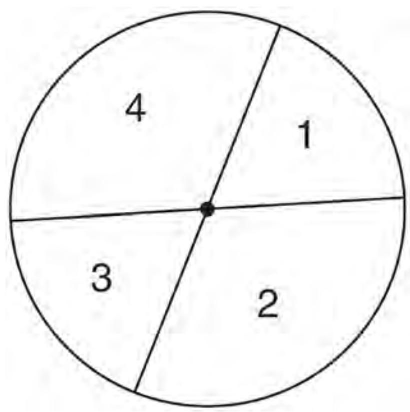
28 Three marbles are to be drawn at random, without replacement, from a bag containing 15 red marbles, 10 blue marbles, and 5 white marbles. Which expression can be used to calculate the probability of drawing 2 red marbles and 1 white marble from the bag?
1 $\frac{{}_{15}C_2 \cdot {}_5C_1}{{}_{30}C_3}$
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

29 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

30 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

31 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 $\frac{225}{512}$

32 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?

33 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.

34 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.

35 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.

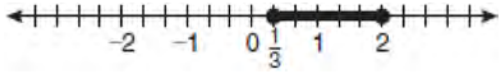
ABSOLUTE VALUE

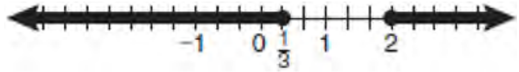
A2.A.1: ABSOLUTE VALUE EQUATIONS AND INEQUALITIES

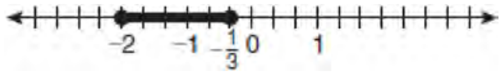
36 What is the solution set of the equation $|4a+6|-4a=-10$?

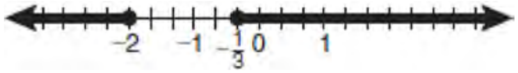
1 $\varnothing$
2 $\{0\}$
3 $\left\{\frac{1}{2}\right\}$
4 $\left\{0,\frac{1}{2}\right\}$

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

1 

2 

3 

4 

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

QUADRATICS

A2.A.20-21: ROOTS OF QUADRATICS

39 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 $= -\frac{2}{3}$

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

41 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 $4x^2 + 3x - 2 = 0$

42 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 $2x^2 - 6x + 4 = 0$

43 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

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

45 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 $2x^2(2x + 3)(3x - 2)$

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

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

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

A2.A.25: QUADRATIC FORMULA

48 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 $\frac{7 \pm \sqrt{73}}{4}$

49 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

50 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

51 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

52 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

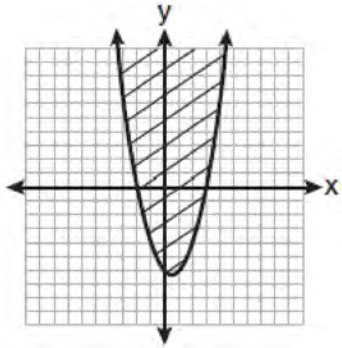
53 Brian correctly used a method of completing the square to solve the equation $x^2 + 7x - 11 = 0$. Brian's first step was to rewrite the equation as $x^2 + 7x = 11$. He then added a number to both sides of the equation. Which number did he add?
1 $\frac{7}{2}$
2 $\frac{49}{4}$
3 $\frac{49}{2}$
4 49

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

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

A2.A.4: QUADRATIC INEQUALITIES

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



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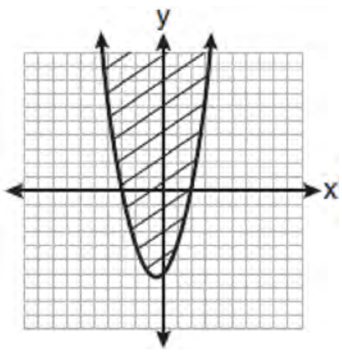

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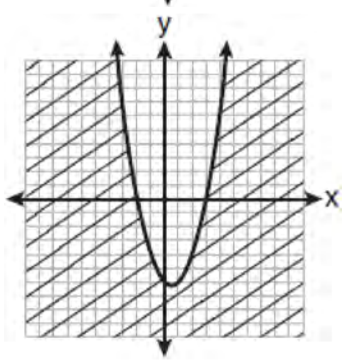

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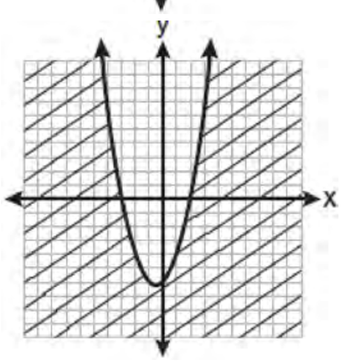


4

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

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

SYSTEMS

A2.A.3: QUADRATIC-LINEAR SYSTEMS

59 Which values of x are in the solution set of the following system of equations?

$$y = 3x - 6$$

$$y = x^2 - x - 6$$

1 $0, -4$
2 $0, 4$
3 $6, -2$
4 $-6, 2$

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

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

POWERS

A2.N.3: OPERATIONS WITH POLYNOMIALS

61 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 $x^2 - x - 3$

62 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 $\frac{x^2}{16}-\frac{x}{6}-\frac{1}{9}$

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

64 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

65 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 $\frac{8}{9}$

66 The expression $\frac{a^2b^{-3}}{a^{-4}b^2}$ is equivalent to

1 $\frac{a^6}{b^5}$

2 $\frac{b^5}{a^6}$

3 $\frac{a^2}{b}$

4 $a^{-2}b^{-1}$

67 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}

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

1 1

2 $\frac{1}{x}$

3 x

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

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

1 -1

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

3 $\frac{1}{x^2}$

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

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

A2.A.12: EVALUATING EXPONENTIAL EXPRESSIONS

71 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.

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

A2.A.18: EVALUATING LOGARITHMIC EXPRESSIONS

73 The expression $\log_8 64$ is equivalent to

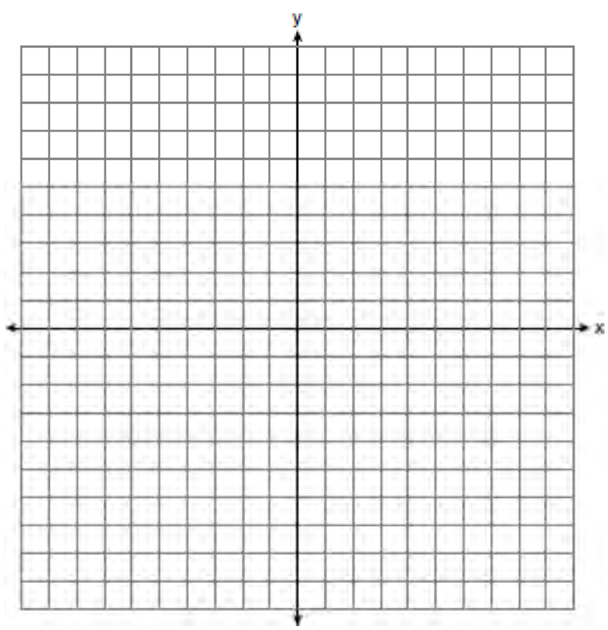
1 8
2 2
3 $\frac{1}{2}$
4 $\frac{1}{8}$

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

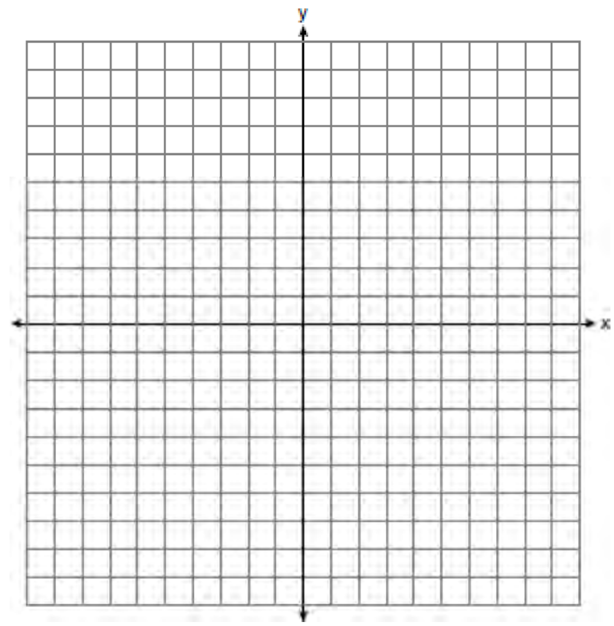
1 $\frac{1}{2}$
2 2
3 $-\frac{1}{2}$
4 -2

A2.A.53: GRAPHING EXPONENTIAL FUNCTIONS

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

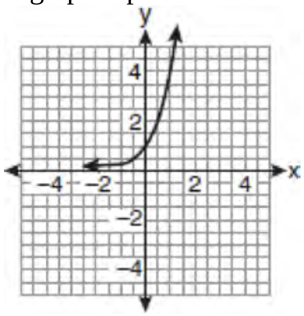


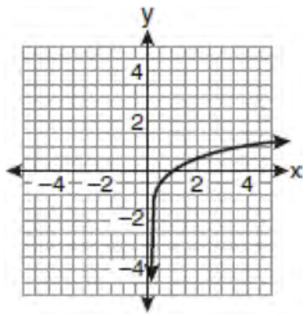
76 The graph of the equation $y = \left(\frac{1}{2}\right)^x$ has an asymptote. On the grid below, sketch the graph of $y = \left(\frac{1}{2}\right)^x$ and write the equation of this asymptote.

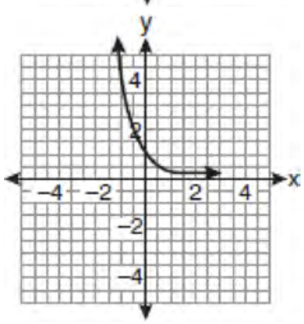


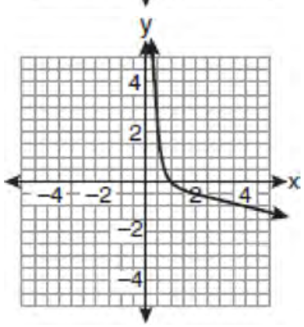
A2.A.54: GRAPHING LOGARITHMIC FUNCTIONS

77 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

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

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

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

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

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

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

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

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

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

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

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

1 $\dfrac{1}{2}\log 5a$

2 $\dfrac{1}{2}\log 6 + \log a$

3 $\log 6 + \log a$

4 $\log 6 + 2\log a$

A2.A.28: LOGARITHMIC EQUATIONS

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

1 1.16
2 20
3 625
4 1,024

82 What is the solution of the equation $2\log_4(5x) = 3$?
1 6.4
2 2.56
3 $\frac{9}{5}$
4 $\frac{8}{5}$

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

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

85 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

86 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

87 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

88 The solution set of $4^{x^2 + 4x} = 2^{-6}$ is
1 $\{1,3\}$
2 $\{-1,3\}$
3 $\{-1,-3\}$
4 $\{1,-3\}$

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

90 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 $\frac{4}{3}$

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

A2.A.36: BINOMIAL EXPANSIONS

92 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

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

94 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 $2x^4y^2$

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

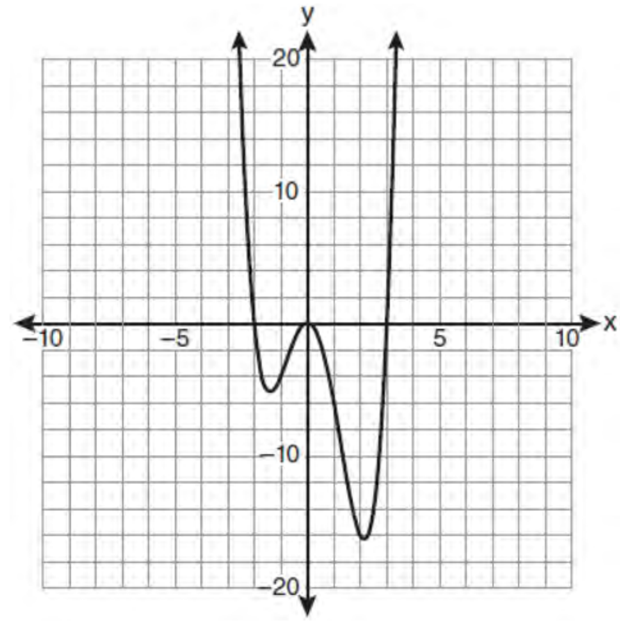
A2.A.26, 50: SOLVING POLYNOMIAL EQUATIONS

96 What is the solution set of the equation $3x^5-48x=0$?
1 $\{0,\pm2\}$
2 $\{0,\pm2,3\}$
3 $\{0,\pm2,\pm2i\}$
4 $\{\pm2,\pm2i\}$

97 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 $0,-1,-2$

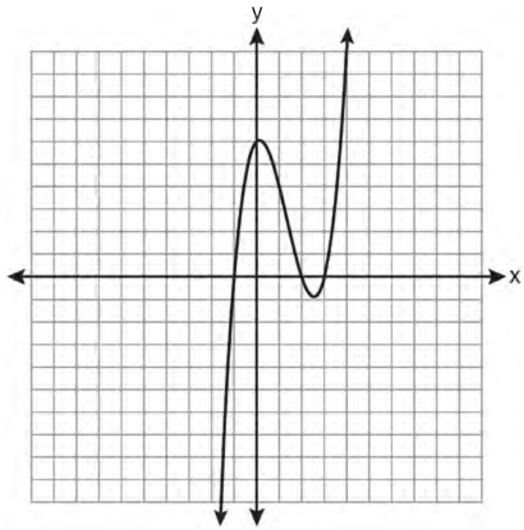
98 Solve the equation $8x^3+4x^2-18x-9=0$ algebraically for all values of x.

99 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 $\{-2,0,3\}$

100 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

RADICALS

A2.A.13: SIMPLIFYING RADICALS

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

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

102 The product of $(3+\sqrt{5})$ and $(3-\sqrt{5})$ is
1 $4-6\sqrt{5}$
2 $14-6\sqrt{5}$
3 14
4 4

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

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

105 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 $-5ab\sqrt{2b} + 7ab\sqrt{6b}$

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

106 Which expression is equivalent to $\dfrac{\sqrt{3}+5}{\sqrt{3}-5}$?
1 $-\dfrac{14+5\sqrt{3}}{11}$
2 $-\dfrac{17+5\sqrt{3}}{11}$
3 $\dfrac{14+5\sqrt{3}}{14}$
4 $\dfrac{17+5\sqrt{3}}{14}$

107 The expression $\dfrac{4}{5-\sqrt{13}}$ is equivalent to
1 $\dfrac{4\sqrt{13}}{5\sqrt{13}-13}$
2 $\dfrac{4(5-\sqrt{13})}{38}$
3 $\dfrac{5+\sqrt{13}}{3}$
4 $\dfrac{4(5+\sqrt{13})}{38}$

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

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

110 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

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

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

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

A2.A.10-11: EXPONENTS AS RADICALS

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

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

116 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

117 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

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

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

A2.N.8: CONJUGATES OF COMPLEX NUMBERS

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

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

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

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

123 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

124 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

125 Solve for x: $\frac{4x}{x-3}=2+\frac{12}{x-3}$

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

A2.A.17: COMPLEX FRACTIONS

127 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 $\frac{x-2}{2}$
4 $\frac{x^2-4}{x+2}$

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

A2.A.5: INVERSE VARIATION

129 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

130 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

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

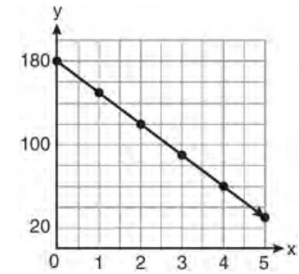
1 $f(y) = 2\sin x + 3$
2 $f(y) = 2\sin\theta + 3$
3 $f(x) = 2\sin\theta + 3$
4 $f(\theta) = 2\sin\theta + 3$

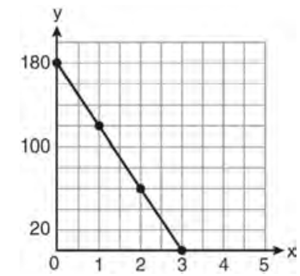
132 If $f(x) = \frac{x}{x^2 - 16}$, what is the value of f(–10)?

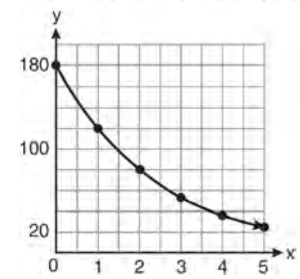
1 $-\frac{5}{2}$
2 $-\frac{5}{42}$
3 $\frac{5}{58}$
4 $\frac{5}{18}$

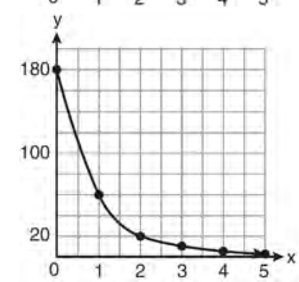
A2.A.52: FAMILIES OF FUNCTIONS

133 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

134 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

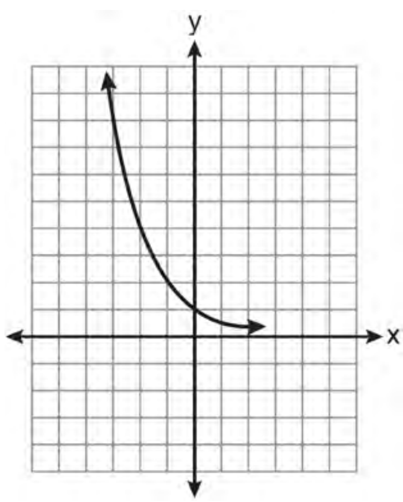
135 Four points on the graph of the function f(x) are shown below.

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

Which equation represents f(x)?

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

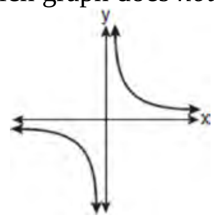
136 Which equation is represented by the graph below?



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

A2.A.38, 43: DEFINING FUNCTIONS

137 Which graph does *not* represent a function?

1


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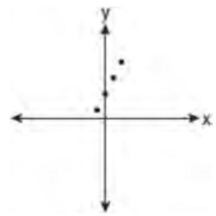

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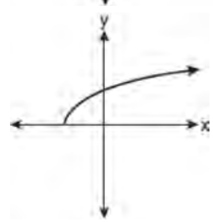

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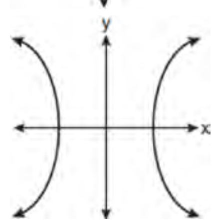
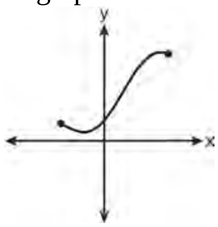


138 Which graph does *not* represent a function?

1


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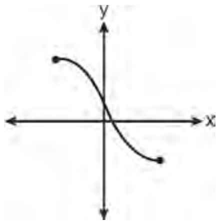

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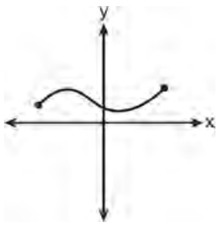

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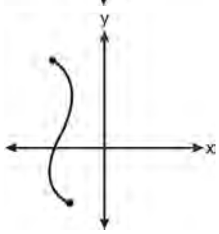
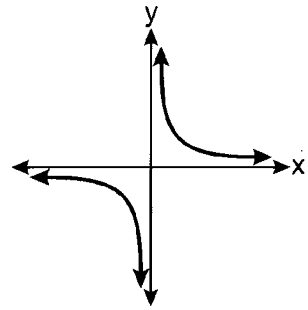


139 Which graph represents a relation that is *not* a function?

1


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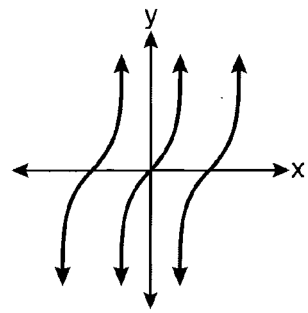

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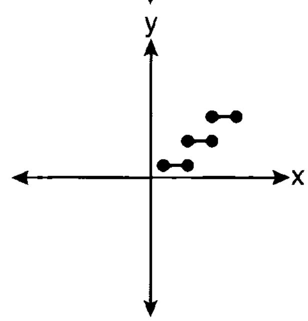

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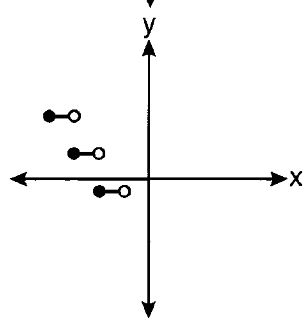
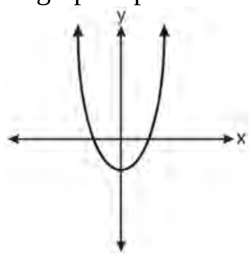
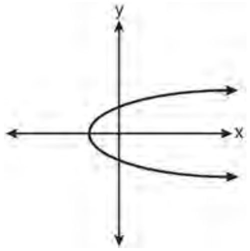


140 Which relation is *not* a function?

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

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


1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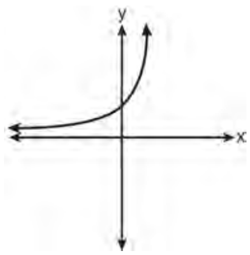
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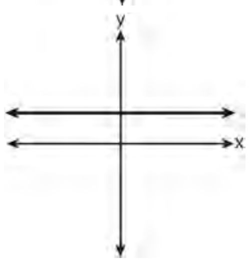

4

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

143 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 $\{(0,1),(1,0),(2,0),(3,2)\}$

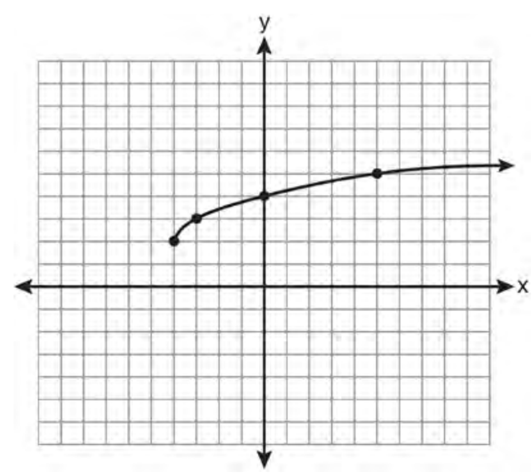
<u>A2.A.39, 51: DOMAIN AND RANGE</u>

144 What is the domain of the function $f(x) = \sqrt{x-2} + 3$?
1 $(-\infty,\infty)$
2 $(2,\infty)$
3 $[2,\infty)$
4 $[3,\infty)$

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

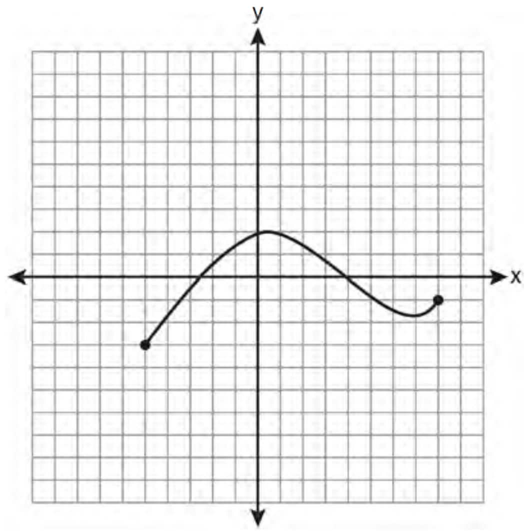
146 What is the range of $f(x) = |x-3| + 2$?
1 $\{x \mid x \ge 3\}$
2 $\{y \mid y \ge 2\}$
3 $\{x \mid x \in \text{real numbers}\}$
4 $\{y \mid y \in \text{real numbers}\}$

147 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 $\{x \mid x \ge -4\}$; $\{y \mid y \ge 2\}$
3 $\{x \mid x > 2\}$; $\{y \mid y > -4\}$
4 $\{x \mid x \ge 2\}$; $\{y \mid y \ge -4\}$

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



State the domain and range of this function.

A2.A.42: COMPOSITIONS OF FUNCTIONS

149 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

150 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

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

152 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 $x^2 + 6x - 5$

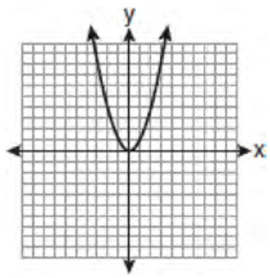
A2.A.44: INVERSE OF FUNCTIONS

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

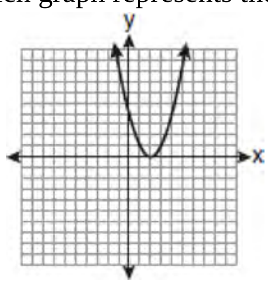
154 If $f(x) = x^2 - 6$, find $f^{-1}(x)$.

A2.A.46: TRANSFORMATIONS WITH FUNCTIONS AND RELATIONS

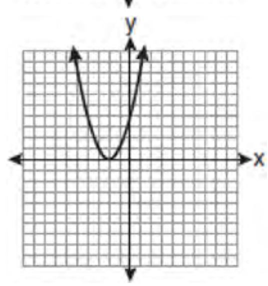
155 The graph below shows the function $\mathrm{f}(x)$.



Which graph represents the function $\mathrm{f}(x+2)$?



1



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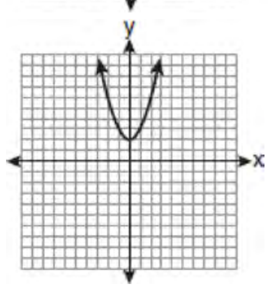

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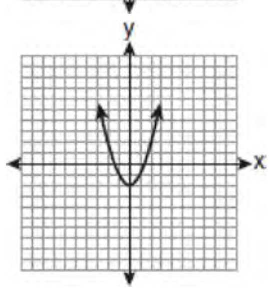


4

156 The minimum point on the graph of the equation $y = \mathrm{f}(x)$ is $(-1,-3)$. What is the minimum point on the graph of the equation $y = \mathrm{f}(x) + 5$?

1 $(-1,2)$
2 $(-1,-8)$
3 $(4,-3)$
4 $(-6,-3)$

SEQUENCES AND SERIES

A2.A.29-33: SEQUENCES

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

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

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

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

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

161 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 $\{n+4, n+16, n+64, n+256, \ldots\}$

162 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 $\frac{37}{3}$

163 What is the fifteenth term of the sequence $5, -10, 20, -40, 80, \ldots$?

1 $-163,840$
2 $-81,920$
3 $81,920$
4 $327,680$

164 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 $16384\sqrt{10}$

165 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

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

1 -38
2 -12
3 26
4 62

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

1 12
2 22
3 24
4 26

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

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

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

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

A2.A.35: SERIES

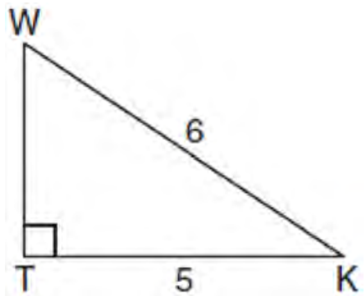
172 An auditorium has 21 rows of seats. The first row has 18 seats, and each succeeding row has two more seats than the previous row. How many seats are in the auditorium?
1 540
2 567
3 760
4 798

173 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

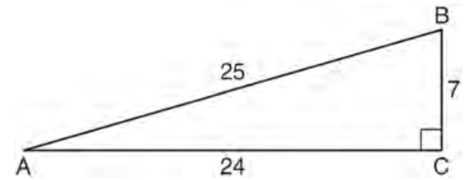
A2.A.55: TRIGONOMETRIC RATIOS

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



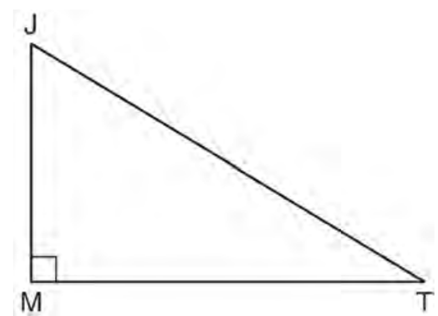
What is the measure of $\angle K$, to the *nearest minute*?
1 33°33'
2 33°34'
3 33°55'
4 33°56'

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



1 $\frac{25}{24}$
2 $\frac{25}{7}$
3 $\frac{24}{7}$
4 $\frac{7}{24}$

176 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

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

178 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

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

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

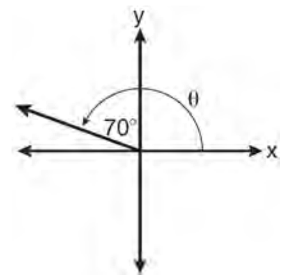
1 $\frac{360}{\pi}$
2 $\frac{\pi}{360}$
3 360
4 90

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

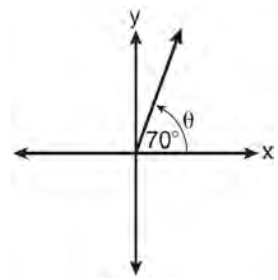
182 Find, to the *nearest minute*, the angle whose measure is 3.45 radians.

A2.A.60: UNIT CIRCLE

183 In which graph is θ coterminal with an angle of –70°?



1



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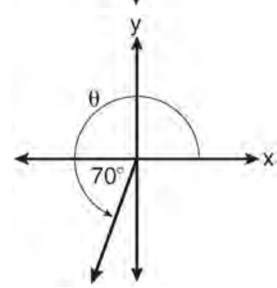

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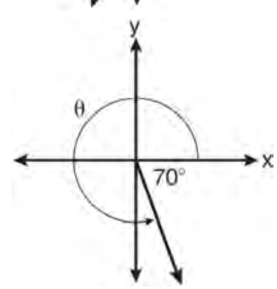

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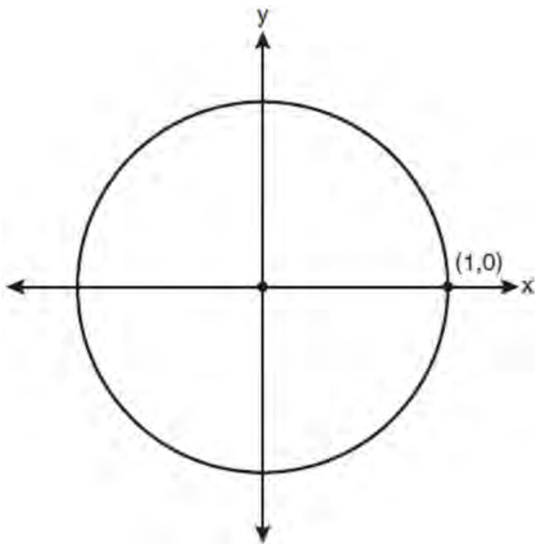
184 On the unit circle shown in the diagram below, sketch an angle, in standard position, whose degree measure is 240 and find the exact value of $\sin 240°$.



A2.A.62, 66: DETERMINING TRIGONOMETRIC FUNCTIONS

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

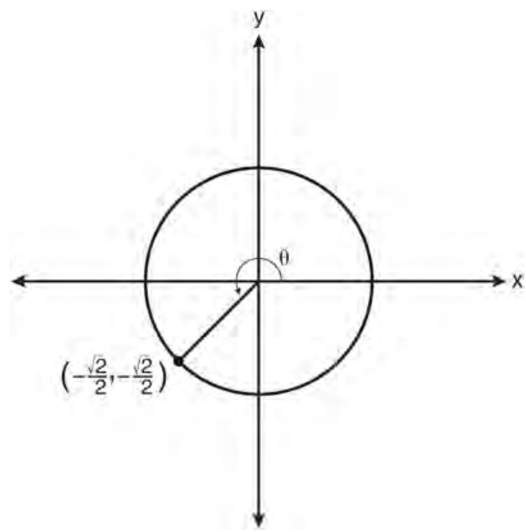
186 The value of $\tan 126°43'$ to the *nearest ten-thousandth* is
1 -1.3407
2 -1.3408
3 -1.3548
4 -1.3549

187 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

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

189 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

190 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

191 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

192 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

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

193 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 $\cot(90° - A) = \frac{1}{3}$

194 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 $\csc^2\theta$

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

A2.A.67: PROVING TRIGONOMETRIC IDENTITIES

196 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 $\cos x + \sin x$

197 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

198 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 $-\frac{63}{65}$

199 The expression $\cos 4x \cos 3x + \sin 4x \sin 3x$ is equivalent to

1 $\sin x$
2 $\sin 7x$
3 $\cos x$
4 $\cos 7x$

200 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 $\tan(A+B)$.

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

A2.A.77: DOUBLE AND HALF ANGLE IDENTITIES

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

203 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 $-\frac{4\sqrt{5}}{9}$

A2.A.68: TRIGONOMETRIC EQUATIONS

204 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

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

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

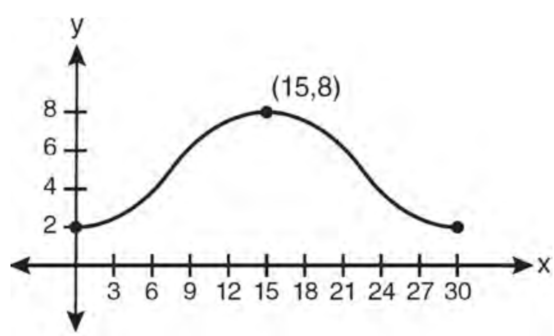
A2.A.69: PROPERTIES OF TRIGONOMETRIC FUNCTIONS

207 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

208 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

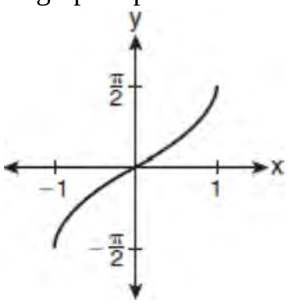
209 Which equation is graphed in the diagram below?



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

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

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



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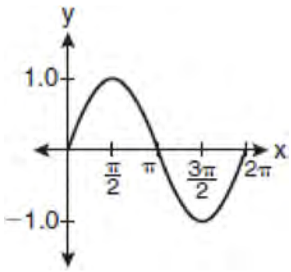

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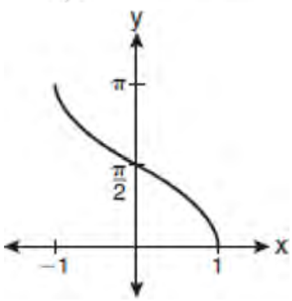

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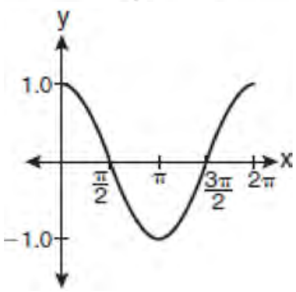

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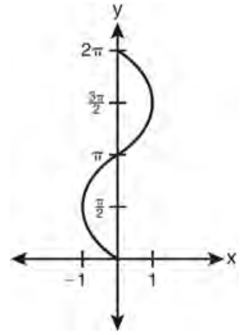
211 Which graph shows $y = \cos^{-1} x$?



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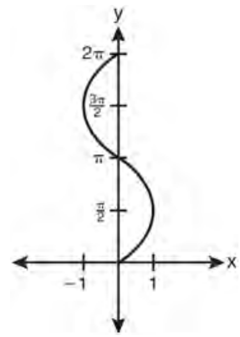

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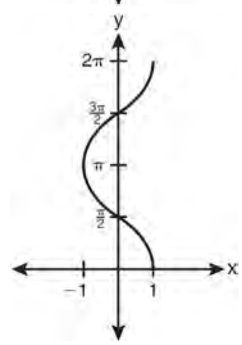

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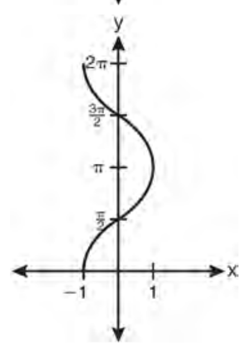

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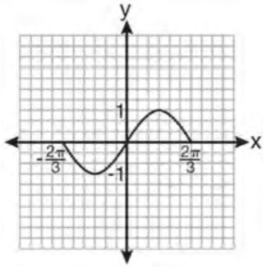
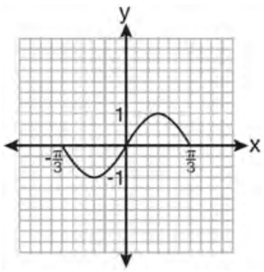
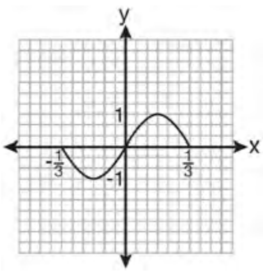
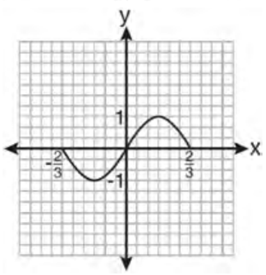
212 Which graph represents one complete cycle of the equation $y = \sin 3\pi x$?

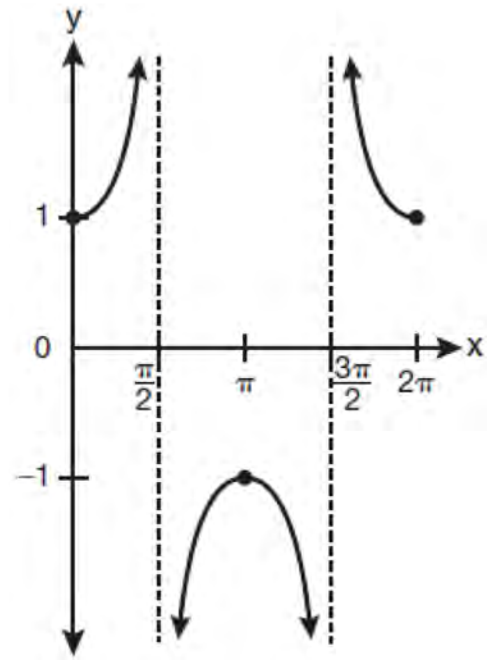
1 

2 

3 

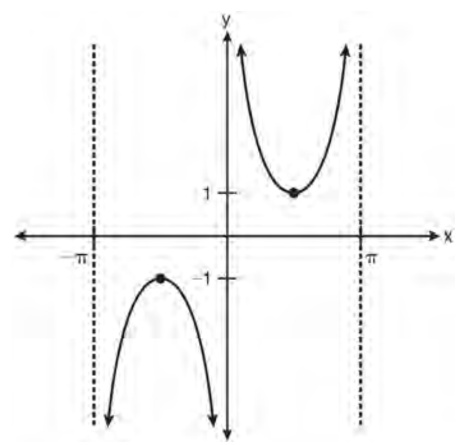
4 

213 Which equation is represented by the graph below?



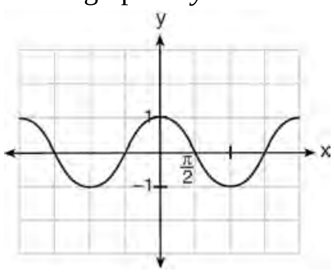
1 $y = \cot x$
2 $y = \csc x$
3 $y = \sec x$
4 $y = \tan x$

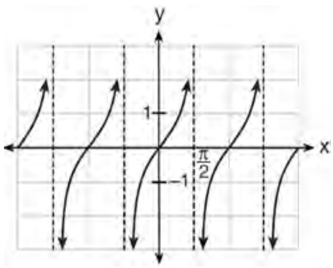
214 Which equation is sketched in the diagram below?

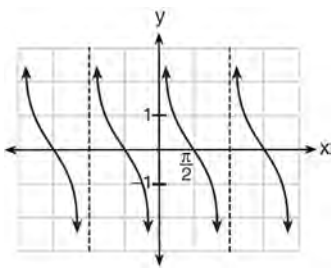


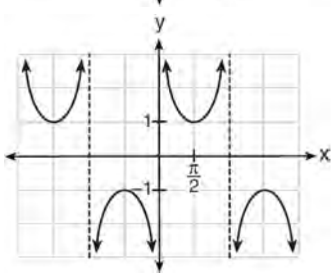
1 $y = \csc x$
2 $y = \sec x$
3 $y = \cot x$
4 $y = \tan x$

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

1 

2 

3 

4 

A2.A.63: DOMAIN AND RANGE

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

A2.A.74: USING TRIGONOMETRY TO FIND AREA

217 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

218 In parallelogram $BFLO$, $OL = 3.8$, $LF = 7.4$, 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

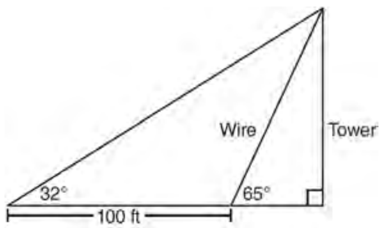
219 The sides of a parallelogram measure 10 cm and 18 cm. One angle of the parallelogram measures 46 degrees. What is the area of the parallelogram, to the *nearest square centimeter*?
1 65
2 125
3 129
4 162

220 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*.

A2.A.73: LAW OF SINES

221 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*.

222 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*.



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

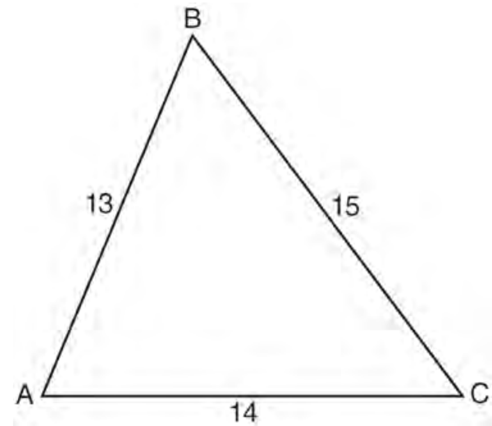
223 In $\triangle ABC$, $m\angle A = 74$, $a = 59.2$, and $c = 60.3$. What are the two possible values for $m\angle C$, to the *nearest tenth*?
1 73.7 and 106.3
2 73.7 and 163.7
3 78.3 and 101.7
4 78.3 and 168.3

224 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

225 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

A2.A.73: LAW OF COSINES

226 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

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

228 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

229 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.

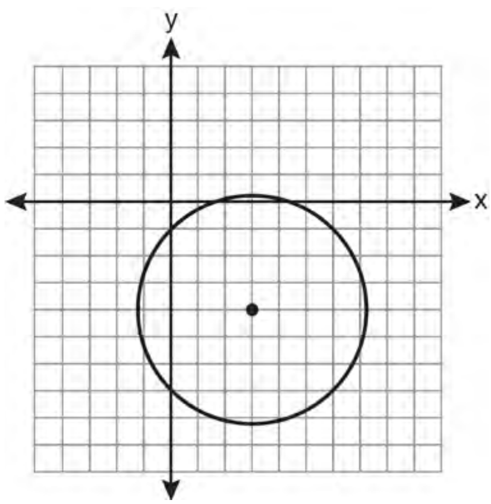
CONICS

A2.A.47, 49: EQUATIONS OF CIRCLES

230 The equation $x^2 + y^2 - 2x + 6y + 3 = 0$ is equivalent to

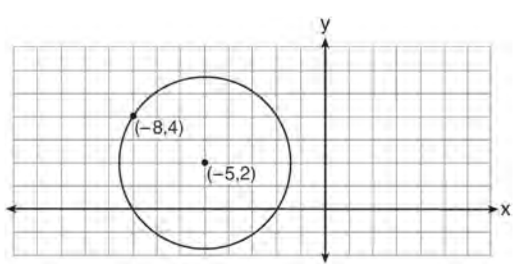
1 $(x-1)^2 + (y+3)^2 = -3$
2 $(x-1)^2 + (y+3)^2 = 7$
3 $(x+1)^2 + (y+3)^2 = 7$
4 $(x+1)^2 + (y+3)^2 = 10$

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

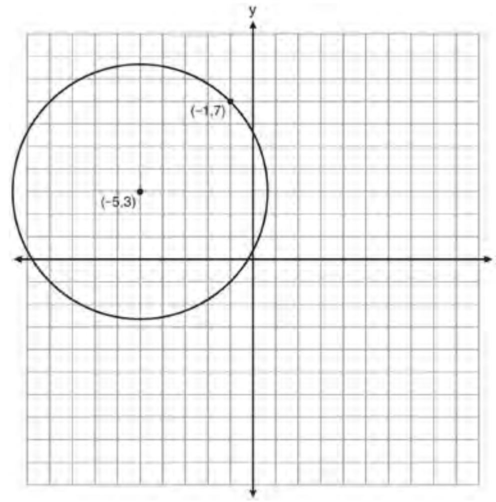


1 $(x-3)^2 + (y+4)^2 = 16$
2 $(x-3)^2 + (y+4)^2 = 18$
3 $(x+3)^2 + (y-4)^2 = 16$
4 $(x+3)^2 + (y-4)^2 = 18$

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



233 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.

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