

0619AI

1 The expression $w^4 - 36$ is equivalent to

- 1) $(w^2 - 18)(w^2 - 18)$
- 2) $(w^2 + 18)(w^2 - 18)$
- 3) $(w^2 - 6)(w^2 - 6)$
- 4) $(w^2 + 6)(w^2 - 6)$

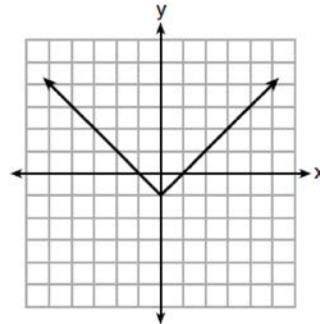
2 If $f(x) = 4x + 5$, what is the value of $f(-3)$?

- 1) -2
- 2) -7
- 3) 17
- 4) 4

3 Which relation is *not* a function?

1)

x	y
-10	-2
-6	2
-2	6
1	9
5	13

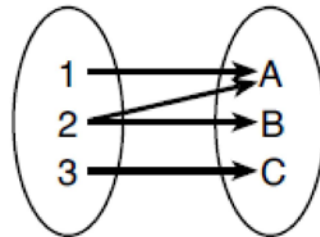


1)

3)

2) $3x + 2y = 4$

4)



4 Given: $f(x) = (x - 2)^2 + 4$

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

When compared to the graph of $f(x)$, the graph of $g(x)$ is

- 1) shifted 3 units to the left
- 2) shifted 3 units to the right
- 3) shifted 5 units to the left
- 4) shifted 5 units to the right

5 Students were asked to write $6x^5 + 8x - 3x^3 + 7x^7$ in standard form. Shown below are four student responses.

Anne: $7x^7 + 6x^5 - 3x^3 + 8x$

Bob: $-3x^3 + 6x^5 + 7x^7 + 8x$

Carrie: $8x + 7x^7 + 6x^5 - 3x^3$

Dylan: $8x - 3x^3 + 6x^5 + 7x^7$

Which student is correct?

- 1) Anne
- 2) Bob
- 3) Carrie
- 4) Dylan

6 The function f is shown in the table below.

x	$f(x)$
0	1
1	3
2	9
3	27

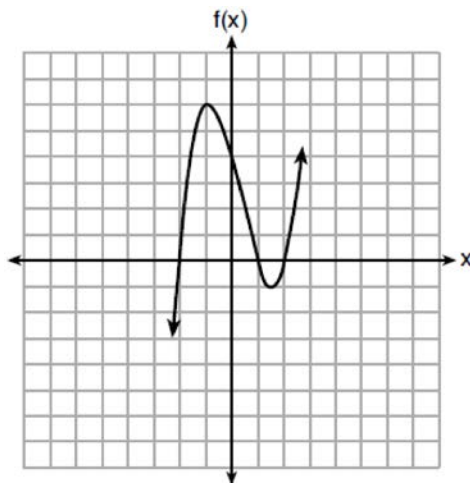
Which type of function best models the given data?

- 1) exponential growth function 3) linear function with positive rate of change
 2) exponential decay function 4) linear function with negative rate of change

7 Which expression results in a rational number?

- 1) $\sqrt{2} \cdot \sqrt{18}$ 3) $\sqrt{2} + \sqrt{2}$
 2) $5 \cdot \sqrt{5}$ 4) $3\sqrt{2} + 2\sqrt{3}$

8 A polynomial function is graphed below.



Which function could represent this graph?

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

9 When solving $p^2 + 5 = 8p - 7$, Kate wrote $p^2 + 12 = 8p$. The property she used is

- 1) the associative property 3) the distributive property
 2) the commutative property 4) the addition property of equality

10 David wanted to go on an amusement park ride. A sign posted at the entrance read "You must be greater than 42 inches tall and no more than 57 inches tall for this ride." Which inequality would model the height, x , required for this amusement park ride?

- 1) $42 < x \leq 57$
- 2) $42 > x \geq 57$
- 3) $42 < x$ or $x \leq 57$
- 4) $42 > x$ or $x \geq 57$

11 Which situation can be modeled by a linear function?

- 1) The population of bacteria triples every day.
- 2) The value of a cell phone depreciates at a rate of 3.5% each year.
- 3) An amusement park allows 50 people to enter every 30 minutes.
- 4) A baseball tournament eliminates half of the teams after each round.

12 Jenna took a survey of her senior class to see whether they preferred pizza or burgers. The results are summarized in the table below.

	Pizza	Burgers
Male	23	42
Female	31	26

Of the people who preferred burgers, approximately what percentage were female?

- 1) 21.3
- 2) 38.2
- 3) 45.6
- 4) 61.9

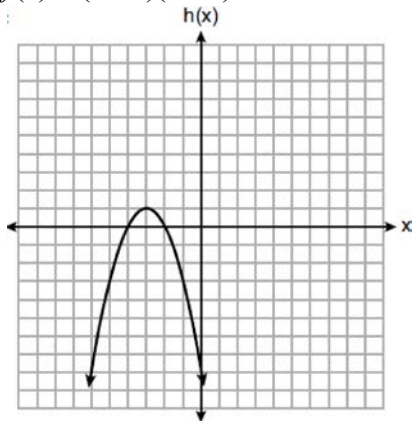
13 When $3a + 7b > 2a - 8b$ is solved for a , the result is

- 1) $a > -b$
- 2) $a < -b$
- 3) $a < -15b$
- 4) $a > -15b$

14 Three functions are shown below.

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

B: $f(x) = (x + 2)(x + 6)$



C:

Which statement is true?

- 1) B and C have the same zeros.
- 2) A and B have the same y -intercept.
- 3) B has a minimum and C has a maximum.
- 4) C has a maximum and A has a minimum.

21 The roots of $x^2 - 5x - 4 = 0$ are

- 1) 1 and 4
2) $\frac{5 \pm \sqrt{41}}{2}$
3) -1 and -4
4) $\frac{-5 \pm \sqrt{41}}{2}$

22 The following table shows the heights, in inches, of the players on the opening-night roster of the 2015-2016 New York Knicks.

84	80	87	75	77	79	80	74	76	80	80	82	82
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The population standard deviation of these data is approximately

- 1) 3.5
2) 13
3) 79.7
4) 80
- 23 A population of bacteria can be modeled by the function $f(t) = 1000(0.98)^t$, where t represents the time since the population started decaying, and $f(t)$ represents the population of the remaining bacteria at time t . What is the rate of decay for this population?
- 1) 98%
2) 2%
3) 0.98%
4) 0.02%
- 24 Bamboo plants can grow 91 centimeters per day. What is the approximate growth of the plant, in inches per hour?
- 1) 1.49
2) 3.79
3) 9.63
4) 35.83

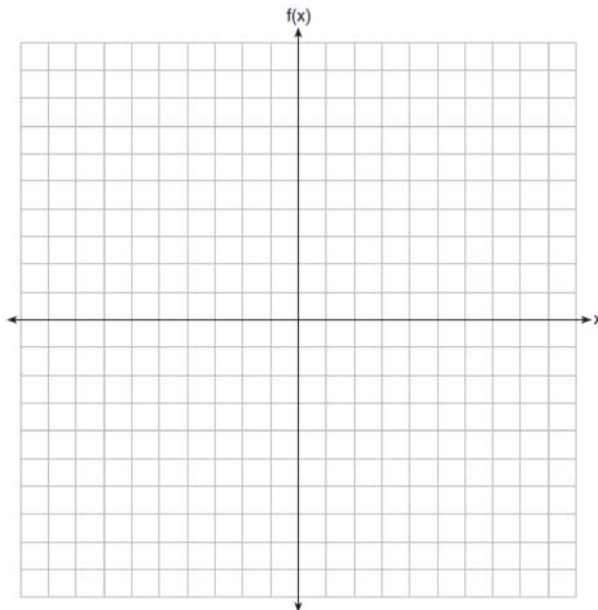
25 Solve algebraically for x :

$$-\frac{2}{3}(x + 12) + \frac{2}{3}x = -\frac{5}{4}x + 2$$

26 If $C = G - 3F$, find the trinomial that represents C when $F = 2x^2 + 6x - 5$ and $G = 3x^2 + 4$.

- 27 Graph the following piecewise function on the set of axes below.

$$f(x) = \begin{cases} |x|, & -5 \leq x < 2 \\ -2x + 10, & 2 \leq x \leq 6 \end{cases}$$



- 28 Solve $5x^2 = 180$ algebraically.

- 29 A blizzard occurred on the East Coast during January, 2016. Snowfall totals from the storm were recorded for Washington, D.C. and are shown in the table below.

Washington, D.C.	
Time	Snow (inches)
1 a.m.	1
3 a.m.	5
6 a.m.	11
12 noon	33
3 p.m.	36

Which interval, 1 a.m. to 12 noon or 6 a.m. to 3 p.m., has the greater rate of snowfall, in inches per hour? Justify your answer.

- 30 The formula for the volume of a cone is $V = \frac{1}{3} \pi r^2 h$. Solve the equation for h in terms of V , r , and π .

- 31 Given the recursive formula:

$$a_1 = 3$$

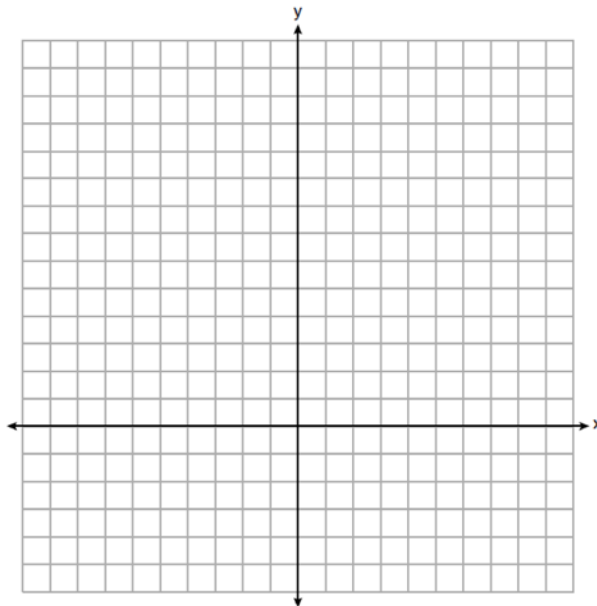
$$a_n = 2(a_{n-1} + 1)$$

State the values of a_2 , a_3 , and a_4 for the given recursive formula.

- 32 Determine and state the vertex of $f(x) = x^2 - 2x - 8$ using the method of completing the square.
- 33 A school plans to have a fundraiser before basketball games selling shirts with their school logo. The school contacted two companies to find out how much it would cost to have the shirts made. Company A charges a \$50 set-up fee and \$5 per shirt. Company B charges a \$25 set-up fee and \$6 per shirt. Write an equation for Company A that could be used to determine the total cost, A , when x shirts are ordered. Write a second equation for Company B that could be used to determine the total cost, B , when x shirts are ordered. Determine algebraically and state the minimum number of shirts that must be ordered for it to be cheaper to use Company A .
- 34 Graph $y = f(x)$ and $y = g(x)$ on the set of axes below.

$$f(x) = 2x^2 - 8x + 3$$

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



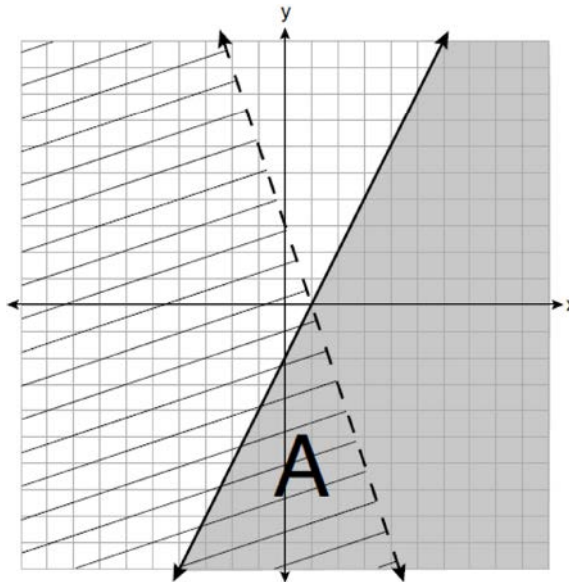
Determine and state all values of x for which $f(x) = g(x)$.

- 35 The table below shows the number of hours ten students spent studying for a test and their scores.

Hours Spent Studying (x)	0	1	2	4	4	4	6	6	7	8
Test Scores (y)	35	40	46	65	67	70	82	88	82	95

Write the linear regression equation for this data set. Round all values to the *nearest hundredth*. State the correlation coefficient of this line, to the *nearest hundredth*. Explain what the correlation coefficient suggests in the context of the problem.

- 36 A system of inequalities is graphed on the set of axes below.



State the system of inequalities represented by the graph. State what region A represents. State what the entire gray region represents.

- 37 When visiting friends in a state that has no sales tax, two families went to a fast-food restaurant for lunch. The Browns bought 4 cheeseburgers and 3 medium fries for \$16.53. The Greens bought 5 cheeseburgers and 4 medium fries for \$21.11. Using c for the cost of a cheeseburger and f for the cost of medium fries, write a system of equations that models this situation. The Greens said that since their bill was \$21.11, each cheeseburger must cost \$2.49 and each order of medium fries must cost \$2.87 each. Are they correct? Justify your answer. Using your equations, algebraically determine both the cost of one cheeseburger and the cost of one order of medium fries.

0619AI

Answer Section

- 1 ANS: 4 PTS: 2 REF: 061901ai NAT: A.SSE.A.2
TOP: Factoring the Difference of Perfect Squares KEY: higher power AI
- 2 ANS: 2
 $f(-3) = -12 + 5 = -7$
- PTS: 2 REF: 061902ai NAT: F.IF.A.2 TOP: Functional Notation
- 3 ANS: 4 PTS: 2 REF: 061903ai NAT: F.IF.A.1
TOP: Defining Functions KEY: mixed
- 4 ANS: 2 PTS: 2 REF: 061904ai NAT: F.BF.B.3
TOP: Graphing Polynomial Functions
- 5 ANS: 1 PTS: 2 REF: 061905ai NAT: A.SSE.A.1
TOP: Modeling Expressions
- 6 ANS: 1 PTS: 2 REF: 061906ai NAT: F.LE.A.1
TOP: Families of Functions
- 7 ANS: 1
 $\sqrt{2} \cdot \sqrt{18} = \sqrt{36} = \frac{6}{1}$ may be expressed as the ratio of two integers.
- PTS: 2 REF: 061907ai NAT: N.RN.B.3 TOP: Operations with Radicals
KEY: classify
- 8 ANS: 3
 $f(x) = (x - 1)(x^2 - 4) = (x - 1)(x - 2)(x + 2)$
- PTS: 2 REF: 061908ai NAT: A.APR.B.3 TOP: Graphing Polynomial Functions
- 9 ANS: 4 PTS: 2 REF: 061909ai NAT: A.REI.A.1
TOP: Identifying Properties
- 10 ANS: 1 PTS: 2 REF: 061910ai NAT: A.CED.A.1
TOP: Modeling Linear Inequalities
- 11 ANS: 3 PTS: 2 REF: 061911ai NAT: F.LE.A.1
TOP: Families of Functions
- 12 ANS: 2
 $\frac{26}{42 + 26} = 0.382$
- PTS: 2 REF: 061912ai NAT: S.ID.B.5 TOP: Frequency Tables
KEY: two-way
- 13 ANS: 4
 $a + 7b > -8b$
 $a > -15b$
- PTS: 2 REF: 061913ai NAT: A.REI.B.3 TOP: Solving Linear Inequalities

- 14 ANS: 3
 1) B 's zeros are -2 and -6 and C 's zeros are -4 and -2 ; 2) A 's y -intercept is 4 and B 's y -intercept is 12 ; 3) B in standard form, $a > 0$ and C in standard form, $a < 0$; d) A has no minimum

PTS: 2 REF: 061914ai NAT: F.IF.C.9 TOP: Comparing Functions

- 15 ANS: 2 PTS: 2 REF: 061915ai NAT: A.CED.A.1
 TOP: Modeling Linear Equations

- 16 ANS: 2 PTS: 2 REF: 061916ai NAT: S.ID.B.6
 TOP: Regression KEY: exponential

- 17 ANS: 3 PTS: 2 REF: 061917ai NAT: A.SSE.A.2
 TOP: Factoring Polynomials KEY: quadratic

- 18 ANS: 3
 $10.25 \neq 3(1.25)^2 - 1.25 + 7$

PTS: 2 REF: 061918ai NAT: A.REI.D.10 TOP: Identifying Solutions

- 19 ANS: 2 PTS: 2 REF: 061919ai NAT: F.IF.A.3
 TOP: Sequences KEY: difference or ratio

- 20 ANS: 4 PTS: 2 REF: 061920ai NAT: F.IF.B.5
 TOP: Domain and Range

- 21 ANS: 2

$$\frac{5 \pm \sqrt{(-5)^2 - 4(1)(-4)}}{2(1)} = \frac{5 \pm \sqrt{41}}{2}$$

PTS: 2 REF: 061921ai NAT: A.REI.B.4 TOP: Solving Quadratics
 KEY: quadratic formula

- 22 ANS: 1 PTS: 2 REF: 061922ai NAT: S.ID.A.2
 TOP: Dispersion KEY: basic

- 23 ANS: 2 PTS: 2 REF: 061923ai NAT: F.LE.B.5
 TOP: Modeling Exponential Functions

- 24 ANS: 1

$$\frac{91 \text{ cm}}{\text{day}} \times \frac{1 \text{ day}}{24 \text{ hrs}} \times \frac{1 \text{ inch}}{2.54 \text{ cm}} \approx \frac{1.49 \text{ in}}{\text{hr}}$$

PTS: 2 REF: 061924ai NAT: N.Q.A.1 TOP: Conversions
 KEY: dimensional analysis

25 ANS:

$$-12\left(-\frac{2}{3}(x+12) + \frac{2}{3}x = -\frac{5}{4}x + 2\right)$$

$$8(x+12) - 8x = 15x - 24$$

$$8x + 96 - 8x = 15x - 24$$

$$120 = 15x$$

$$8 = x$$

PTS: 2 REF: 061925ai NAT: A.REI.B.3 TOP: Solving Linear Equations

KEY: fractional expressions

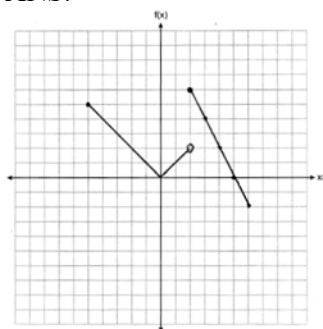
26 ANS:

$$C = 3x^2 + 4 - 3(2x^2 + 6x - 5) = 3x^2 + 4 - 6x^2 - 18x + 15 = -3x^2 - 18x + 19$$

PTS: 2 REF: 061926ai NAT: A.APR.A.1 TOP: Operations with Polynomials

KEY: subtraction

27 ANS:



PTS: 2 REF: 061927ai NAT: F.IF.C.7 TOP: Graphing Piecewise-Defined Functions

28 ANS:

$$5x^2 = 180$$

$$x^2 = 36$$

$$x = \pm 6$$

PTS: 2 REF: 061928ai NAT: A.REI.B.4 TOP: Solving Quadratics

KEY: taking square roots

29 ANS:

$$\frac{33-1}{12-1} \approx 2.9 \quad \frac{36-11}{15-6} \approx 2.8 \quad \text{The interval 1 a.m. to 12 noon has the greater rate.}$$

PTS: 2 REF: 061929ai NAT: F.IF.B.6 TOP: Rate of Change

30 ANS:

$$V = \frac{1}{3} \pi r^2 h$$

$$3V = \pi r^2 h$$

$$\frac{3V}{\pi r^2} = h$$

PTS: 2 REF: 061930ai NAT: A.CED.A.4 TOP: Transforming Formulas

31 ANS:

$$a_2 = 2(3+1) = 8 \quad a_3 = 2(8+1) = 18 \quad a_4 = 2(18+1) = 38$$

PTS: 2 REF: 061931ai NAT: F.IF.A.3 TOP: Sequences

KEY: recursive

32 ANS:

$$f(x) = (x^2 - 2x + 1) - 8 - 1 = (x - 1)^2 - 9 \quad (1, -9)$$

PTS: 2 REF: 061932ai NAT: F.IF.C.8 TOP: Vertex Form of a Quadratic

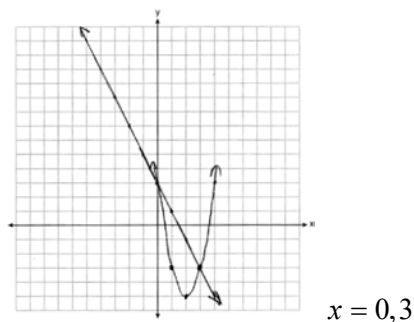
33 ANS:

$$A(x) = 5x + 50 \quad 5x + 50 < 6x + 25 \quad 26 \text{ shirts}$$

$$B(x) = 6x + 25 \quad 25 < x$$

PTS: 4 REF: 061933ai NAT: A.CED.A.3 TOP: Modeling Linear Inequalities

34 ANS:



PTS: 4 REF: 061934ai NAT: A.REI.D.11 TOP: Quadratic-Linear Systems

35 ANS:

$$y = 7.79x + 34.27 \quad r = 0.98 \quad \text{high, positive correlation between hours spent studying and test scores}$$

PTS: 4 REF: 061935ai NAT: S.ID.B.6 TOP: Regression

KEY: linear with correlation coefficient

36 ANS:

$y < -3x + 3$ Region A represents the solution set of the system. The gray region represents the solution set of

$$y \leq 2x - 2$$

$$y \leq 2x - 2.$$

PTS: 4

REF: 061936ai

NAT: A.CED.A.3

TOP: Modeling Systems of Linear Inequalities

37 ANS:

$4c + 3f = 16.53$ No, because $5(2.49) + 4(2.87) \neq 21.11$. $16c + 12f = 66.12$ $4(2.79) + 3f = 16.53$

$$5c + 4f = 21.11$$

$$\underline{15c + 12f = 63.33}$$

$$3f = 5.37$$

$$c = 2.79$$

$$f = 1.79$$

PTS: 6

REF: 061937ai

NAT: A.CED.A.3

TOP: Modeling Linear Systems