TEST NAME: **Math 8 F.2**
TEST ID: **668870**
GRADE: **08 - 09**
SUBJECT: **Mathematics**
TEST CATEGORY: **School Assessment**

Student:

Class:

Date:

Read the passage - 'Pollution Research' - and answer the question below:

Pollution Research

Pollution Research

In her environmental science class, Kaylie has been learning about air pollution. The teacher told the class that pollution occurs when chemicals and particles are released into the air we breathe. These pollutants can be very harmful to people and other living organisms in the environment.

Several natural processes release pollutants. Most pollution is caused by human activities that release hazardous chemicals into the air through their exhaust: when cars run and burn gasoline, when factories use coal for fuel, or even when gas stoves are used to cook food. These chemicals, when exposed to sunlight, can react with other substances to form smog, which is the haze that is often seen surrounding large cities. Air pollution and smog are harmful to people's health and to the environment. They have been known to aggravate asthma and respiratory disease as well as to cause acid rain.

Kaylie is interested in learning more about what causes air pollution and what she can do to minimize it. She has noticed that the city she lives in has areas with more smog than others. She would like to know what chemicals are present in the air in this city. She goes to the local climate research center to get more information.

At the research center, scientists inform Kaylie that the main source of pollution in the area is car exhaust from commuters traveling in and out of the city every day. Car exhaust produces a chemical known as nitrogen dioxide that can absorb light and eventually create pollutants. The scientists tell Kaylie that when nitrogen dioxide breaks down, it forms particles of oxygen that are different from the oxygen we breathe. These oxygen particles combine with other substances in the air to form pollutants. Kaylie realizes that when the nitrogen dioxide from car exhaust breaks down and decreases in amount, this means that oxygen particles, and therefore pollutants, are being formed and are increasing in amount.

The scientists at the research center have been doing pollution experiments in their laboratories. They have been comparing the amount of nitrogen dioxide that breaks down with the amount of oxygen particles formed. They do this by measuring the concentrations of these substances over short periods to see how they change. Concentrations are determined by finding the amount of a substance per unit volume. In this case, the scientists measured concentration in micrograms $(\mu g)^*$ per cubic meter $(m)^3$. They let Kaylie look at the results from a recent investigation.

CONCENTRATIONS OVER TIME

Time (minutes)	Nitrogen Dioxide ($\mu g/m^3$)	Oxygen Particles ($\mu g/m^3$)
0	47.20	0
5	6.72	14.08
10	0.96	16.08
15	0.14	16.37
20	0.019	16.41

These results show how the concentration of nitrogen dioxide and oxygen particles changed in relation to one another over a period of 20 minutes. After looking at the results, Kaylie is convinced that nitrogen dioxide is harmful to the environment. She will remember her trip to the research center the next time she needs to go somewhere. Maybe she will try walking or riding her bike more often!

* Micrograms are very small units that are a fraction of a gram, so $1\ \mu g = 10^{-6}\ g$.

1. Read "Pollution Research" and answer the questions.

Kaylie wants to do her own investigation studying pollution. She decides to study how the concentration over time of a different substance, substance B, changes. She finds that the concentration of substance B decreases over time. The formulas for exponential growth and decay are shown below, where *y* represents the amount of a substance after a particular period of time, A_0 represents the initial amount of the substance, *k* represents the growth or decay constant that is particular to the type of substance, and *t* represents the time.

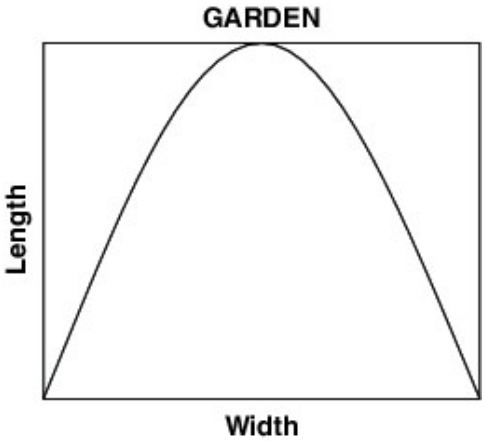
$$y = A_0 e^{kt}$$
$$y = A_0 e^{-kt}$$

Kaylie also finds that substance B has the same initial concentration as nitrogen dioxide but has a different constant, *k*.

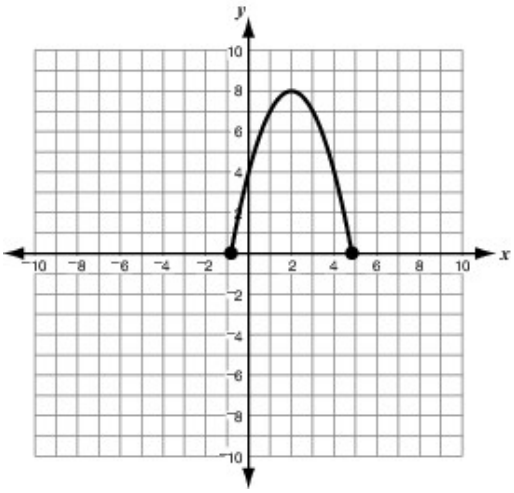
- If $k = 0.6$ for substance B, use the appropriate formula to write a function, $g(t)$, that represents the growth or decay of this substance over time.
- Compare the *y*-intercepts and rates of increase and/or decrease of the graphs for the concentrations of nitrogen dioxide and substance B. Explain how they are different, the same, or both.
-

Use words, numbers, and/or pictures to show your work.

2. Gunther is an engineer, and he is planning to construct parabolic paths in two different rectangular gardens. He plans to build them in such a way that the maximum points of the parabolic paths exactly touch the outer edges of the rectangular gardens as shown.



The parabolic path of garden A is described as $f(x) = -x^2 + 2x + 5$, where $f(x) \geq 0$ in feet, and the parabolic path of garden B is shown in the graph below, where $f(x) \geq 0$ in feet.



Part A: If the distance between the *x*-intercepts of parabolas represents the widths of the gardens, find the widths of gardens A and B and compare them.

Part B: If the maximum height of parabolas represents the lengths of the gardens, find the lengths of gardens A and B and compare them.

Use words, numbers, and/or pictures to show your work.

3. A parking deck for a museum uses the equation $y = 2.75x + 5$ to calculate the cost, y, to park a car x number of hours. A parking deck for a hotel uses the table below to calculate the cost to park a car hourly.

Hotel Parking Deck

Hours	Cost
3	$14.75
6	$21.50
10	$30.50

Which parking deck charges the most per hour and by how much?

A. The parking deck for the hotel charges $1.50 more per hour.

B. The parking deck for the museum charges $1.50 more per hour.

C. The parking deck for the hotel charges $0.50 more per hour.

D. The parking deck for the museum charges $0.50 more per hour.

4. Function $f(x)$ is represented by the table of values below.

x	$f(x)$
0	0
1	1
5	25
10	100
12	144

Function $g(x)$ is represented by $4 \cdot 10^x$.

What is true of both functions?

A. Neither function is linear.

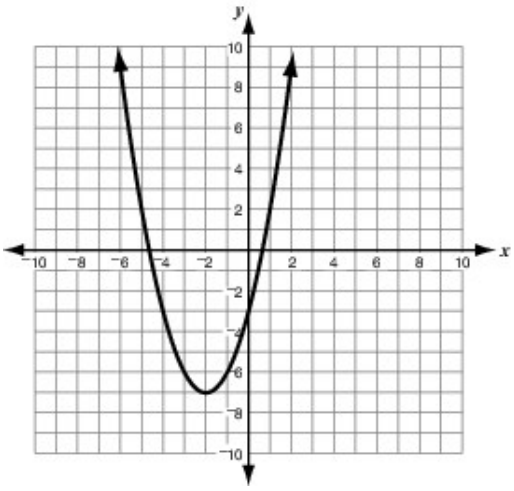
B. Neither function is exponential.

C. The minimum of each function is at the origin.

D. For both functions, the value of y varies inversely with the value of x.

5. The graph and the table given below represent two quadratic functions.

Function 1



Function 2

x	y
1	−2
0	3
−2	7
−4	3
−5	−2

Which of these features do the two functions have in common?

A. vertex

B. y-intercept

C. end behavior

D. line of symmetry

6. **Motion of a Soccer Ball**

One quantity that can be described very usefully by quadratic functions is motion. For example, a table, a graph, or an equation can give the motion of a falling object, the movement of a planet around the Sun, or the swinging of a pendulum. In this problem, you will study the motion of a soccer ball.

Part A. This table shows some points on the path of a soccer ball that was kicked from the ground. The *x*-values represent the horizontal distance in feet from the starting point, and the *y*-values give the vertical distance. Plot the points on the graph below and sketch the curve.

x	*y*
0	0
6	9
12	16
18	21
24	24
36	24
42	21
48	16
54	9
60	0

Part B. Based on the graph, at what horizontal distance from the starting point do you think the soccer ball will reach its **maximum** height? Explain your answer.

Estimate the **maximum** height from the graph.

Part C. The path of the soccer ball forms a parabola. The equation for the function is $y = -\frac{1}{36}(x-30)^2+25$.

Test the values you found in part B for the **maximum** point of the graph. See whether those values for the *x*- and *y*-coordinates satisfy the equation. If not, adjust your values until they satisfy the equation.

Part D. Test four other points from the table in the equation. Be sure to show your work.

$x = 0$
$x = 12$
$x = 36$
$x = 54$

Part E. Another player kicks the soccer ball. It goes higher than the first ball but not as far. It reaches a **maximum** height of 36 feet and goes a horizontal distance of 48 feet. At a point when the ball has traveled a horizontal distance of 12 feet from the kicker, its height is 27 feet. When the ball has traveled a horizontal distance of 44 feet from the kicker, its height is 11 feet.

From this description, create a table of values for the points you know, including $(0, 0)$, the starting point. In addition to the points given in the description, think about other points you can figure out from the information given and the shape of the graph. Explain how you know these points.

x	y
0	0

Part F. Plot these points and sketch the curve on the same graph in part A.

Part G. Study the pattern in the equation given in part C for the path of the first soccer ball, $y = a(x - b)^2 + c$. Which number gives the **maximum** height of the ball? Which number tells how far the graph is shifted to the right? (Remember that in the equation $y = ax^2$, the **maximum** or **minimum** is on the *y*-axis.)

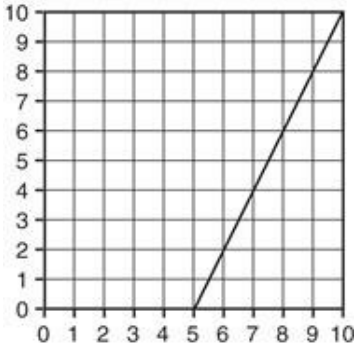
Fill in those values to create the equation for the path of the second soccer ball. Then, choose one of the given points and solve to find the value of *a*. Write the full equation.

Part H. After writing your equation, test three values from your table in part E. Be sure to show your work.

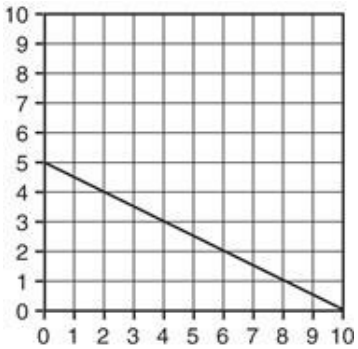
$x = 12$
$x = 44$
$x = 48$

7. **Which graph best represents the equation** $y = 10 - 2x$?

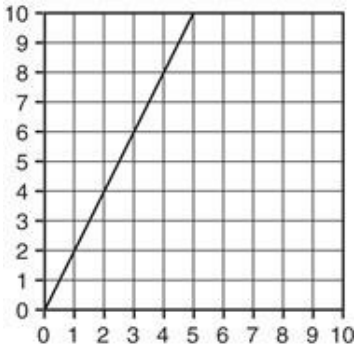
A.



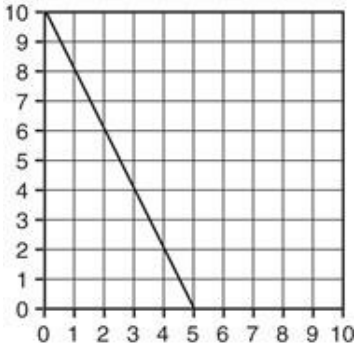
B.



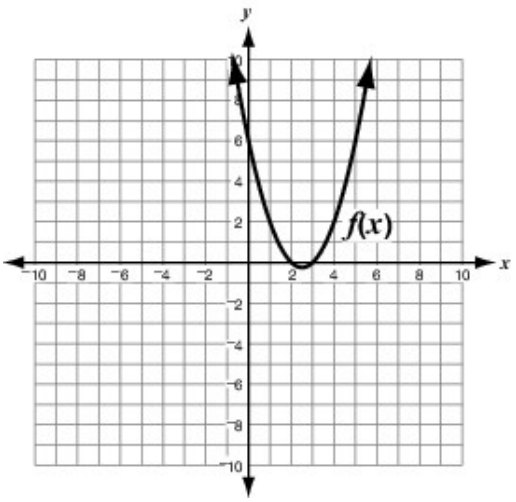
C.



D.



8. A quadratic function $g(x)$ has the same x-intercepts as $f(x)$ and a y-intercept 18 units less than the y-intercept of $f(x)$.



Which of these statements is true?

A. minimum of $g(x) = -2(\text{minimum of } f(x))$

B. maximum of $g(x) = -2(\text{minimum of } f(x))$

C. minimum of $g(x) = -3(\text{minimum of } f(x))$

D. maximum of $g(x) = -3(\text{minimum of } f(x))$

9. Green Taxi Company uses the equation $y = 1.75x + 4$ to calculate the total cost for a customer to ride x miles in one of their taxis. White Taxi company uses the table below to calculate the cost for a ride.

White Taxi Company

Miles (x)	**Cost** (y)
3	$10.50
5	$13.50
8	$18.00

Which statement is true?

A. Green Taxi charges $0.25 less per mile than White Taxi.

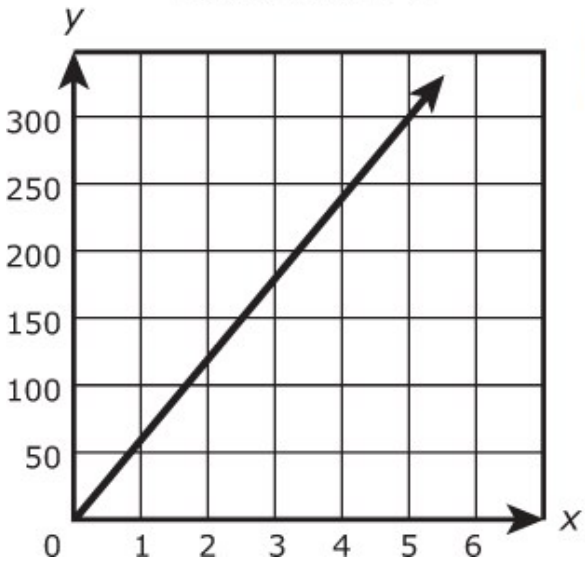
B. Green Taxi charges $0.25 more per mile than White Taxi.

C. Green Taxi charges $2.00 less per mile than White Taxi.

D. Green Taxi charges $2.00 more per mile than White Taxi.

10. Function 1 is shown by the graph. The table shows the coordinates of a different linear function, Function 2.

Function 1



Function 2

x	y
−3	−210
0	0
7	490

Which statement is true?

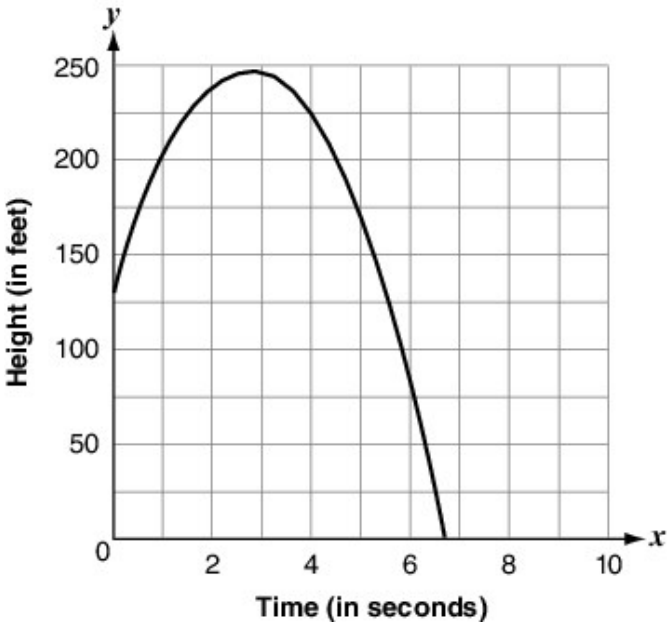
A. The slope of Function 1 is equal to the slope of Function 2.

B. The slope of Function 1 is greater than the slope of Function 2.

C. The y-intercept of Function 1 is the same as the y-intercept of Function 2.

D. The y-intercept of Function 1 is greater than the y-intercept of Function 2.

11. Two toy rockets, A and B, are launched at the same time. The height, in feet, of toy rocket A is modeled by the function $f(x) = -16t^2 + 96t + 112$, where t represents the time the rocket is in the air in seconds. The path of toy rocket B is shown in the graph.



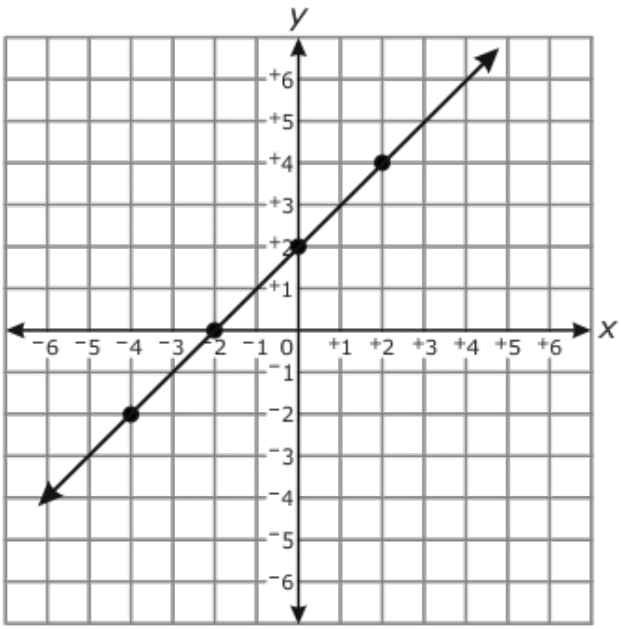
If rocket B reaches a maximum height of 248 feet, what is the difference, in feet, between the maximum heights of the two rockets?

12. The table and graph below represent two different functions.

Function 1

x	*y*
−2	1
2	5
4	7

Function 2



Given the two functions, which statement is true?

A. The slopes of both functions are the same.

B. The *y*-intercepts of both functions are the same.

C. The slope of Function 1 is greater than the slope of Function 2.

13. Two different functions are shown below. One is written as an equation, and the other is given as a table of values.

Function A

$f(x) = 2x$

Function B

x	y
−2	6
−1	3
0	2
1	3
2	6

Which mathematical sentence correctly compares the *y*-intercept of function A to the *y*-intercept of function B?

A. $0 = 0$

B. $0 < 2$

C. $0 < 6$

D. $2 = 2$

14. Company M spends $150.00 to set up their business. They spend $2.00 per item on materials and sell each item for $14.50. A second company, Company P, uses the equation $y = 6.25x - 100$ to determine their profit, *y*, per item sold, *x*. Which statement below is true?

A. Company M must sell 4 fewer items than Company P to make a profit.

B. Company M must sell 50 more items than Company P to make a profit.

C. Company M and Company P must each sell 8 items before making a profit.

D. Company M will have twice the profit of Company P regardless of the number of items sold.

15. A recipe for chocolate chip cookies calls for 4 cups of flour and makes 72 cookies. A recipe for oatmeal cookies uses the table below to determine the amount of flour, x, to make y cookies.

Cup(s) of Flour (x)	**Number of Cookies** (y)
1	16
2	32
3	48

Which statement is true?

A. The chocolate chip recipe makes 2 cookies more per cup of flour than the oatmeal recipe.

B. The oatmeal recipe makes 2 cookies more per cup of flour than the chocolate chip recipe.

C. The chocolate chip recipe makes 8 cookies more per cup of flour than the oatmeal recipe.

D. The oatmeal recipe makes 8 cookies more per cup of flour than the chocolate chip recipe.

16. Ronny's Carpet Cleaning uses the equation $y = 15x + \$22.50$ to calculate the total cost, y, to clean carpet for x number of hours. Juan's Carpet Cleaning uses the table below to calculate the total cost.

Juan's Carpet Cleaning

Number of Hours (x)	**Total Cost** (y)
1	$38.50
3	$65.50
6	$106.00
8	$133.00

Which company charges less per hour, and by how much?

A. Ronny's Carpet Cleaning charges $2.50 less per hour.

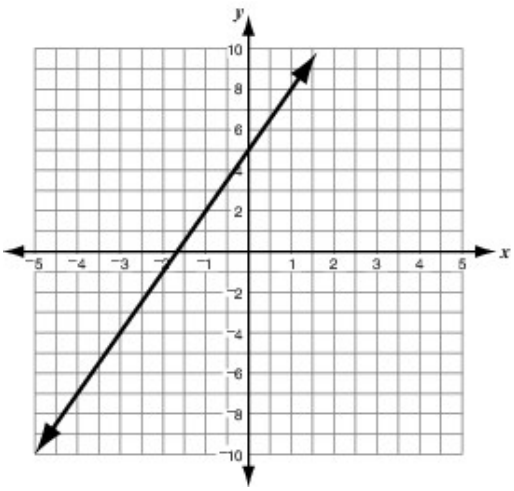
B. Juan's Carpet Cleaning charges $2.50 less per hour.

C. Ronny's Carpet Cleaning charges $1.50 less per hour.

D. Juan's Carpet Cleaning charges $1.50 less per hour.

17. The graph of function 1 and the equation of function 2 are shown below.

Function 1:



Function 2: $y = -4x - 1$

Which statement is **true** of function 1 and function 2?

A. Function 2 has a greater rate of change because the slope of function 1 is -1 and the slope of function 2 is 5.

B. Function 1 has a greater rate of change because the slope of function 1 is 5 and the slope of function 2 is -1.

C. Function 2 has a greater rate of change because the slope of function 1 is -4 and the slope of function 2 is 3.

D. Function 1 has a greater rate of change because the slope of function 1 is 3 and the slope of function 2 is -4.

18. Two plumbing companies charge a flat fee, plus an additional cost per hour of service. Martin's Plumbing uses the equation $y = 40x + 85$ to determine the total cost of providing x hours of service to a customer. The table below shows the total cost to use Alex's Plumbing for different numbers of hours of service.

Alex's Plumbing

Number of Hours (x)	**Total Cost** (y)
3	$240.00
7	$460.00
9	$570.00

What is the difference in the cost per hour charged by the two companies?

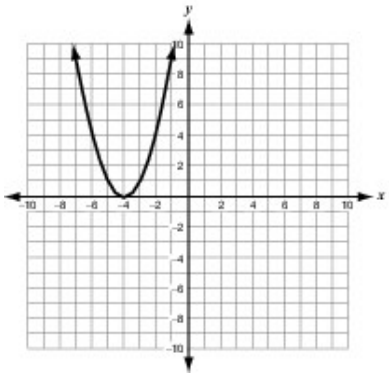
A. $5

B. $10

C. $15

D. $30

19. The function $g(x)$ is shown in the graph below and the function $f(x) = x^2 - 6x + 9$.



Which statement is a correct comparison of the x- and y-intercepts of $f(x)$ and $g(x)$?

A. $f(x)$ has both a greater x-intercept and y-intercept.

B. $g(x)$ has both a greater x-intercept and y-intercept.

C. $f(x)$ has a greater x-intercept and smaller y-intercept.

D. $g(x)$ has a greater x-intercept and smaller y-intercept.

20. The estimated total weight of a tomato plant is determined by adding the weight of the vine and the weight of the fruit. Anna compared the weights of two of her tomato plants.

- Anna used the equation $y = \frac{1}{4}x + 1$, where x represents the number of tomatoes on the vine, to estimate the total weight, y, of her first tomato plant.
- When her second tomato plant had 8 tomatoes on it, the total weight of the plant was 2 pounds.
- When her second tomato plant had 16 tomatoes on it, the total weight of the plant was 3 pounds.

Which statement is true?

A. The weight of a tomato on the first plant is twice the weight of a tomato on the second plant.

B. The weight of a tomato on the first plant is half the weight of a tomato on the second plant.

C. The weight of the vine on the first plant is half the weight of the vine on the second plant.

D. The weight of the vine on the first plant is twice the weight of the vine on the second plant.

21. Function 1 and function 2 can be represented as shown below.

Function 1: $y = -3x + 2$

Function 2:

x	0	1	2	3	4
y	3	1	−1	−3	−5

Which statement **correctly** compares the rates of change of functions 1 and 2?

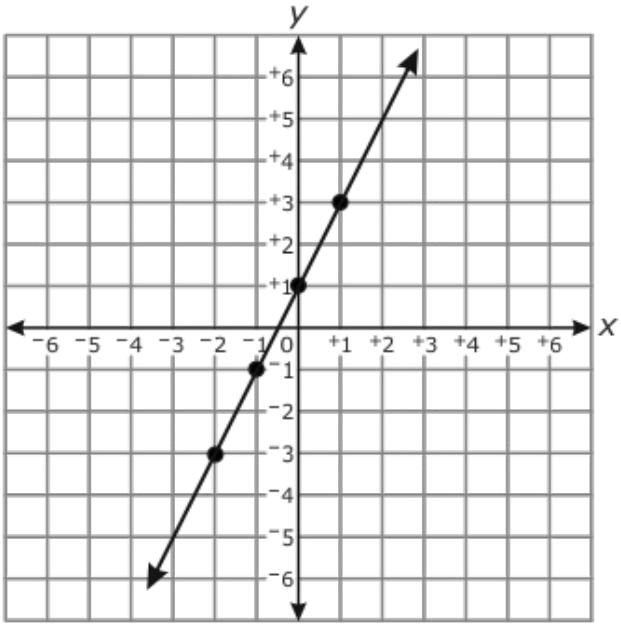
A. The slope of function 1 is -3, and the slope of function 2 is 2, so function 2 is changing at a faster rate.

B. The slope of function 1 is 2, and the slope of function 2 is 3, so function 2 is changing at a faster rate.

C. The slope of function 1 is -3, and the slope of function 2 is -2, so function 1 is changing at a faster rate.

D. The slope of function 1 is -2, and the slope of function 2 is -3, so function 1 is changing at a faster rate.

22. Function J is represented by the equation $y = x + 4$. Function K is shown on the graph below.



What is the difference in the slopes of the two functions?

A. 1

B. 2

C. 3

23. Carla's Catering uses the equation $y = 6.75x + 25$ to calculate the cost for delivering x boxed lunches to an event. The table below shows the total cost Dan's Diner charges to deliver different numbers of boxed lunches to an event.

Number of Lunches (x)	**Total Cost** (y)
5	$57.50
10	$100.00
15	$142.50

If a customer wants to place an order for 12 lunches, which company will provide the lowest total cost, and by how much?

A. Carla's Catering is lower by $11.00.

B. Dan's Diner is lower by $11.00.

C. Carla's Catering is lower by $21.00

D. Dan's Diner is lower by $21.00.

24. The equation of function G is $y = 2x + 6$. The table below shows some of the points of function H.

x	***y***
2	2
4	5
6	8

What is the difference in the y-intercepts of the two functions?

A. 6

B. 7

C. 8

25. A pile of sand erodes at a rate of 1 inch per week. After 2 weeks, the pile of sand is 18 inches in height. A pile of soil erodes according to the table below.

Number of Weeks	Height
1	17.5 inches
3	16.5 inches
6	15 inches
10	13 inches

Which statement is true?

A. The sand pile is initially higher and erodes at a faster rate.

B. The soil pile is initially higher and erodes at a faster rate.

C. The sand pile is initially higher but the soil pile erodes at a faster rate.

D. The soil pile is initially higher but the sand pile erodes at a faster rate.

26. The graph of the linear function, y_1, contains the points in the table below.

y_1

x	y
-1	1
0	3
1	5

Which equation has a graph with the same *y*-intercept but a greater rate of change?

A. $y_2 = x + 3$

B. $y_2 = 3x + 2$

C. $y_2 = 5x + 3$

D. $y_2 = 6x + 2$

27. Two functions are shown below.

Function 1: $y = \frac{6}{5}x + 2$

Function 2:

x	y
-4	-12
-2	-9
0	-6
2	-3
4	0

Which statement is true?

A. The y-intercepts are the same.

B. The slope of Function 1 is greater than the slope of Function 2.

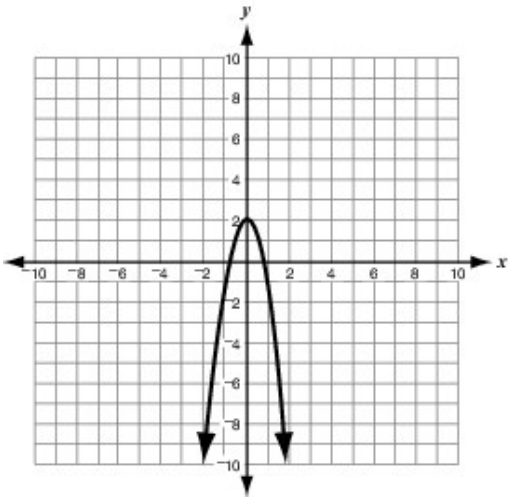
C. The slope of Function 2 is greater than the slope of Function 1.

D. The y-intercept of Function 2 is greater than the y-intercept of Function 1.

28. Which function has no real zeros?

A. $f(x) = 2x^2 + 3$

B.



C.

x	y
-2	-2
-1	1
0	0
1	1
2	-2

D. $f(x) = -3x^2$

29. Function 1 and function 2 can be represented by the description and the table shown below.

Function 1: Mike bought a computer for $1,100, and the computer's value depreciates by $400 each year.

Function 2: Cathy deposits $650 in a new checking account. Each week after that, the amount in her account changes according to the table below, in which *y* represents the total amount in the checking account as a function of the number of weeks, *x*.

x	*y*
1	700
2	750
3	800
4	850

Which statement is **true** of functions 1 and 2?

A. Functions 1 and 2 both have positive slopes, but the *y*-intercept of function 1 is larger than that of function 2.

B. Functions 1 and 2 both have negative slopes, but the *y*-intercept of function 1 is smaller than that of function 2.

C. Function 1 has a positive slope and a smaller *y*-intercept, while function 2 has a negative slope and a larger *y*-intercept.

D. Function 1 has a negative slope and a larger *y*-intercept, while function 2 has a positive slope and a smaller *y*-intercept.

30. The equation of function J is $y = x - 1$. The table below shows some points of function K.

x	*y*
4	1
6	2
8	3

Which is true about the two functions?

A. The slope of function J is greater than the slope of function K.

B. The y-intercept of function J is greater than the y-intercept of function K.

C. The slopes of functions J and K are the same.

31. Sam's Lawn Service uses the equation, $y = 15x + 25$ to calculate the cost, y, to work on a customer's lawn for x number of hours. Ron's Lawn Service uses the table below to calculate the cost to work on a customer's lawn.

Ron's Lawn Service

Hours Worked (x)	**Cost** (y)
2	$49
4	$83
6	$117

If a customer requires 3 hours of lawn work, which lawn service charges less and by how much less?

A. Sam's Lawn Service charges $3.50 less for 3 hours of work.

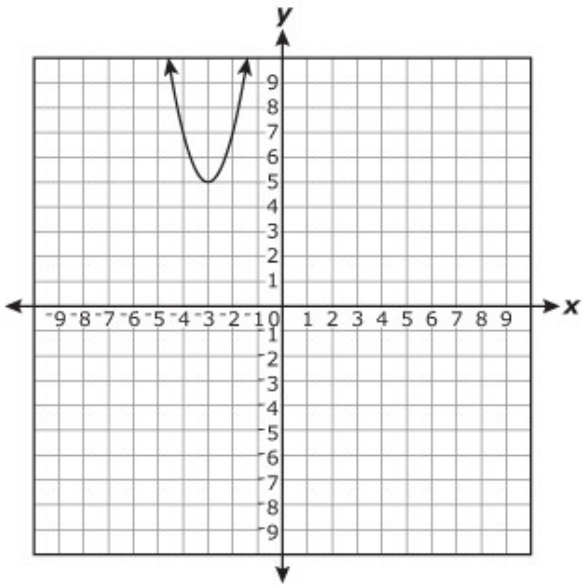
B. Ron's Lawn Service charges $3.50 less for 3 hours of work.

C. Sam's Lawn Service charges $4 less for 3 hours of work.

D. Ron's Lawn Service charges $4 less for 3 hours of work.

32. Which of the following parabolic functions is "narrowest," i.e., has the greatest vertical stretch?

A.



B.

x	$f(x)$
-3	46
-2	33
-1	22
0	13
1	6

C. $f(x) = -3x^2 + 6x - 5$

D. $y = \frac{1}{2}(x-5)^2 + 6$

33. Two functions are shown below.

Function 1: $y = x + 2$

Function 2:

x	***y***
$^{-}2$	$^{-}6$
0	$^{-}3$
2	0

Which function has the greatest slope?

A. Function 1; slope = 1

B. Function 1; slope = 2

C. Function 2; slope = 1.5

D. Function 2; slope = $^{-}3$

34. Smart Student Learning Center charges students a registration fee of $25, plus an hourly rate of $30 for after-school tutoring. Brilliant Student Learning Center charges students for after-school tutoring based on the table below.

Brilliant Student Learning Center

Hours of Tutoring (x)	**Total Cost** (y)
1	$45
3	$115
5	$185
7	$255

If a student needs 4 hours of tutoring, which statement is true?

A. Smart Student Learning Center charges $5 more than Brilliant Student Learning Center.

B. Brilliant Student Learning Center charges $5 more than Smart Student Learning Center.

C. Smart Student Learning Center charges $35 more than Brilliant Student Learning Center.

D. Brilliant Student Learning Center charges $35 more than Smart Student Learning Center.

35. An absolute value function, $f(x)$, has its **minimum** value at $(1, -4)$. Another function is defined by $g(x) = |x + 2| + 4$. Which statement correctly compares the minimum values of $f(x)$ and $g(x)$?

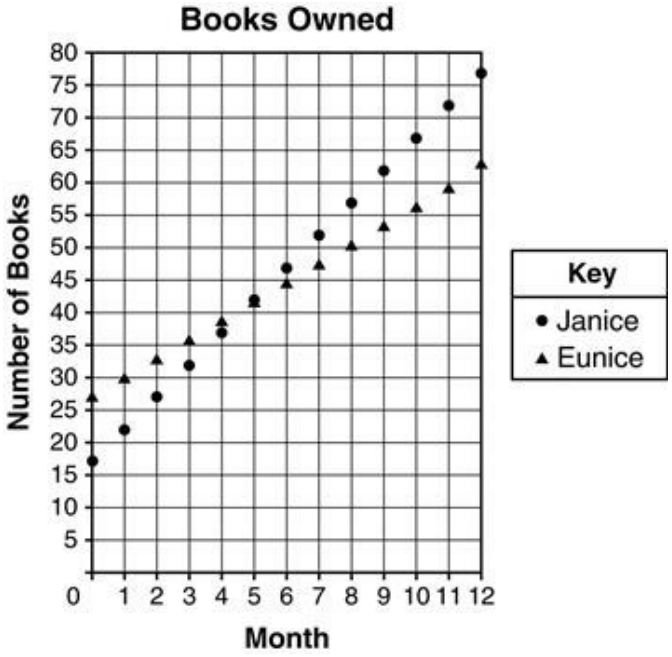
A. The minimum value of $f(x)$ is -4 and $g(x)$ has no minimum value.

B. The minimum value of $f(x)$ is equal to the minimum value of $g(x)$.

C. The minimum value of $f(x)$ is less than the minimum value of $g(x)$.

D. The minimum value of $f(x)$ is greater than the minimum value of $g(x)$.

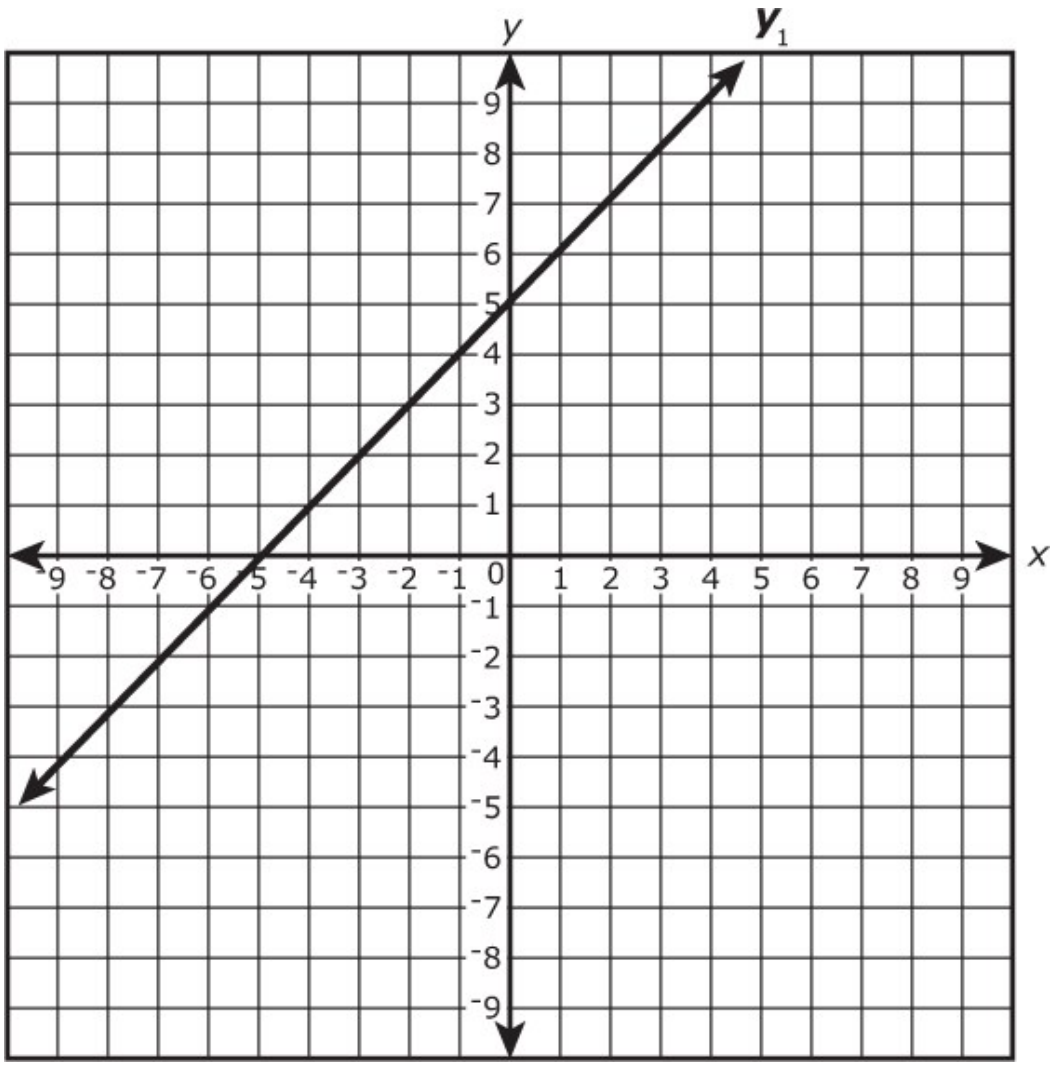
36. **Janice owned 17 books and bought 5 new books each month. Eunice owned 27 books and bought 3 new books each month. The graph below shows the number of books each student owned over a 12-month period.**



Based on this graph, which statement is true?

A. Each student owned 42 books on the fifth month.
B. The students had 42 books altogether on the fifth month.
C. Each student owned 27 books on the second month.
D. The students had 27 books altogether before the first month.

37. The graph of the function y_1 is shown in the grid. The equation of the function y_2 is $y_2 = x - 5$.



Which statement is true about these functions?

A. They both have an *x*-intercept of 5.

B. They both have an x-intercept of 1.

C. They both have a slope of 5.

D. They both have a slope of 1.

38. **Which equation best represents the relationship between *x* and *y* in the table below?**

x	1	2	3	4	5
y	6	9	14	21	30

A. $y = 2x + 5$

B. $y = 3x + 3$

C. $y = x^2 + 5$

D. $y = 2x^2 - 4$

39. The table below represents the x and y values of a quadratic function $g(x)$.

x	y
0	7
1	9
2	9
3	7

If compared with $f(x) = -x^2 + 4x + 6$, which function has a greater maximum value?

40. **Which equation best represents the data in the function table?**

x	y
–3	10
–1	2
0	1
2	5

A. $y = x^2 + 1$
B. $y = x^2 + 2$
C. $y = x^2 - 1$
D. $y = x^2 - 3$

41. Taxi Company #1 uses the equation $y = 4x + 2$ to calculate the cost, y, to ride x number of miles. Taxi Company #2 uses the table below to calculate the cost for a ride.

Taxi Company #2

Miles	Cost
3	$14.95
5	$23.75
8	$36.95

Which company charges the most per mile and by how much?

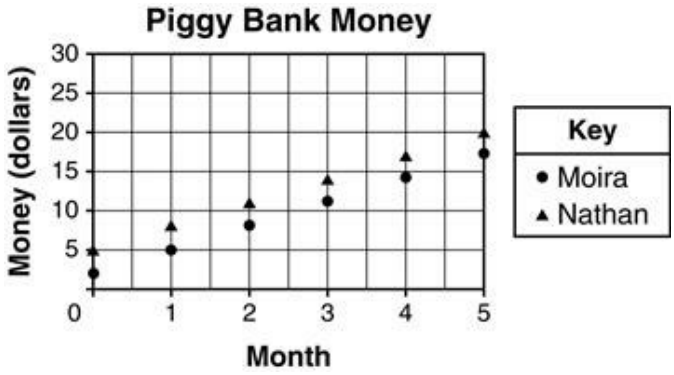
A. Taxi Company #1, by $0.25

B. Taxi Company #2, by $0.25

C. Taxi Company #1, by $0.40

D. Taxi Company #2, by $0.40

42. **Moira placed $2 in an empty piggy bank, and then added $3 every month. The same day, Nathan placed $5 in an empty piggy bank, and then added $3 every month. The graph below represents their savings.**



Based on this graph, which statement is true?

A. The amounts in the piggy banks will never be the same.

B. At the end of 5 months the amounts in the piggy banks will be equal.

C. After the amount in each piggy bank reaches $30, the amounts will continue to be equal.

D. The amounts in the piggy banks will always be equal because each piggy bank receives $3 each month.

43. **Which table best represents the quadratic equation $y = 2x^2$?**

A.

x	*y*
–3	18
–1	2
0	2
2	8

B.

x	*y*
–3	18
–1	2
0	0
2	8

C.

x	*y*
–3	18
–1	4
0	0
2	8

D.

x	*y*
–3	18
–1	2
0	0
2	10

44. **Joanna pays $40 plus a $2 surcharge each month for her high-speed Internet service. Which table best represents the relationship between *m*, the number of months, and *t*, the total amount Joanna pays for the service?**

A.

Joanna's Internet Service Fee

m (number of months)	1	2	3
t (dollars)	$40	$80	$120

B.

Joanna's Internet Service Fee

m (number of months)	1	3	5
t (dollars)	$40	$160	$200

C.

Joanna's Internet Service Fee

m (number of months)	2	4	6
t (dollars)	$42	$82	$122

D.

Joanna's Internet Service Fee

m (number of months)	1	2	3
t (dollars)	$42	$84	$126

45. Mrs. Magee compared the price per pound of two different kinds of fruit, apples and bananas, at her grocery store. She used the equation below to find the cost, y, of x pounds of apples.

Cost of Apples

$$y = 1.40x$$

To find the cost per pound of bananas, she used the following table.

Cost of Bananas

Number of Pounds	Total Cost
2	$1.20
4	$2.40
6	$3.60

What is the difference in the price per pound of apples and bananas?

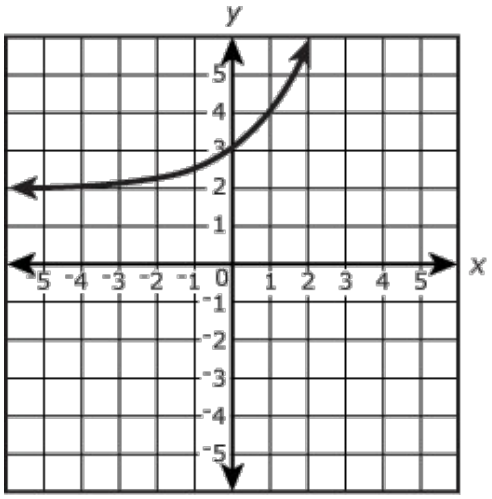
A. $0.80

B. $0.90

C. $1.20

D. $1.40

46. The graph of $f(x)$ is shown on the coordinate plane. A table showing certain values for a quadratic function, $g(x)$, is also shown.



x	$g(x)$
-1	.5
0	1
1	2
2	4

Which statement is true?

A. $f(x)$ has the smaller *y*-intercept.

B. $f(x)$ and $g(x)$ have the same *y*-intercept.

C. $f(x)$ and $g(x)$ increase at the same rate.

D. $f(x)$ increases at a greater rate than $g(x)$.

47. Which statement **correctly** compares the vertex of function A with the vertex of function B?

Function A	**Function B**
$f(x) = 4x^2 + 3$	A function of x equals 3 times the square of x plus 4.

A. The vertex of function A is below the vertex of function B.

B. The vertex of function A is above the vertex of function B.

C. The vertex of function A is to the left of the vertex of function B.

D. The vertex of function A is to the right of the vertex of function B.

48. A pizza restaurant near a college uses the equation $y = 3.25x + 4.25$ to calculate the price of a pizza, y, with x number of toppings. A pizza restaurant in a mall uses the table below to calculate the price of the same size pizza.

Toppings	Price
3	$13.50
5	$20.50
8	$31.00

Which statement is true?

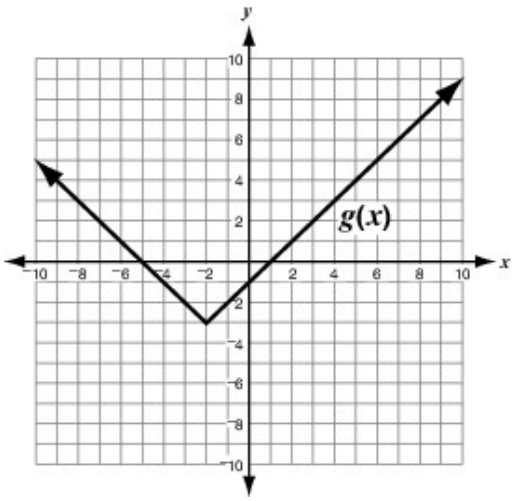
A. The pizza restaurant near the college charges $0.25 more per topping.

B. The pizza restaurant in the mall charges $0.25 more per topping.

C. The pizza restaurant near the college charges $0.50 more per topping.

D. The pizza restaurant in the mall charges $0.50 more per topping.

49. An absolute value function $f(x)$ is described by the expression $|x-2|-3$, and the graph of another absolute value function is shown below.



Which of these statements is **correct**?

A. Both the functions have the same *y*-intercept of -1.

B. Both the functions have a minimum value at $x = -3$.

C. The minimum of $f(x)$ is 4 units more than the minimum of $g(x)$.

D. The *y*-intercept of $f(x)$ is 4 units more than the *y*-intercept of $g(x)$.

50. Pizza Village uses the equation $y = 1.10x + 9$ to calculate the cost of a cheese pizza with x additional toppings. The table below shows the cost of cheese pizza from Mama Mia's based on the number of additional toppings.

Number of Toppings	Total Cost
3	$11.75
5	$14.25
8	$18.00

Which statement is true?

A. Mama Mia's charges $2.82 more per topping than Pizza Village.

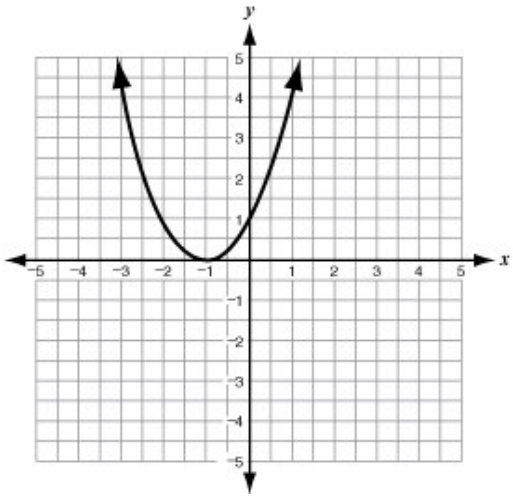
B. Pizza Village charges $2.82 more per topping than Mama Mia's.

C. Mama Mia's charges $0.15 more per topping than Pizza Village.

D. Pizza Village charges $0.15 more per topping than Mama Mia's.

51. Two different functions are shown below. Which characteristic do function A and function B have in common?

Function A



Function B
$f(x) = x^2 + 2x - 1$

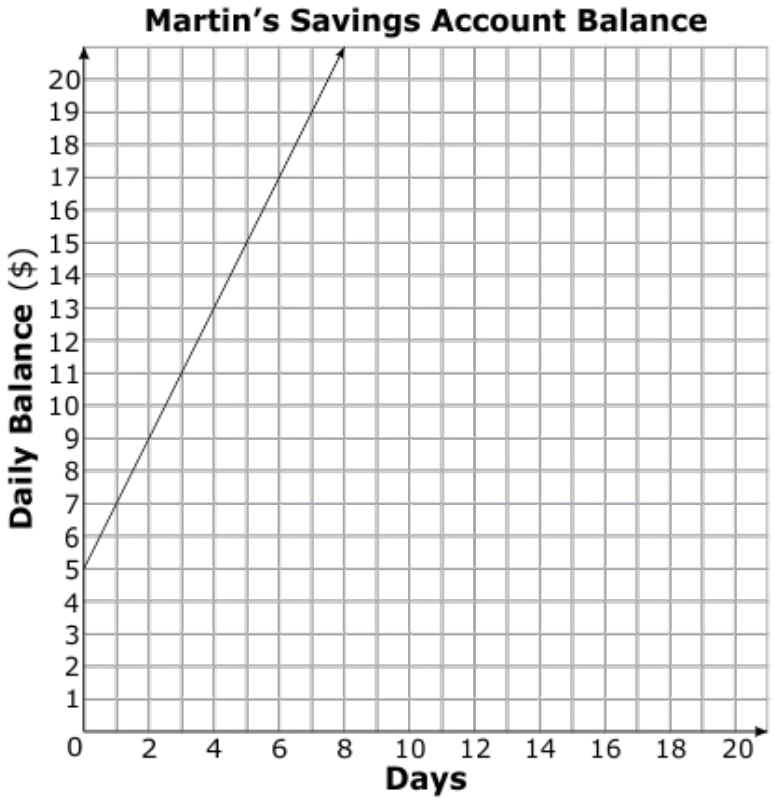
A. vertex

B. *x*-intercept

C. *y*-intercept

D. axis of symmetry

52. Martin's savings account balance is represented in the graph below.



Suzie's savings account balance is represented in the table below.

Days (x)	**Account Balance** (y)
3	$19.50
6	$24.00
10	$30.00
15	$37.50

Who has less money in their savings account on the 12th day, and by how much?

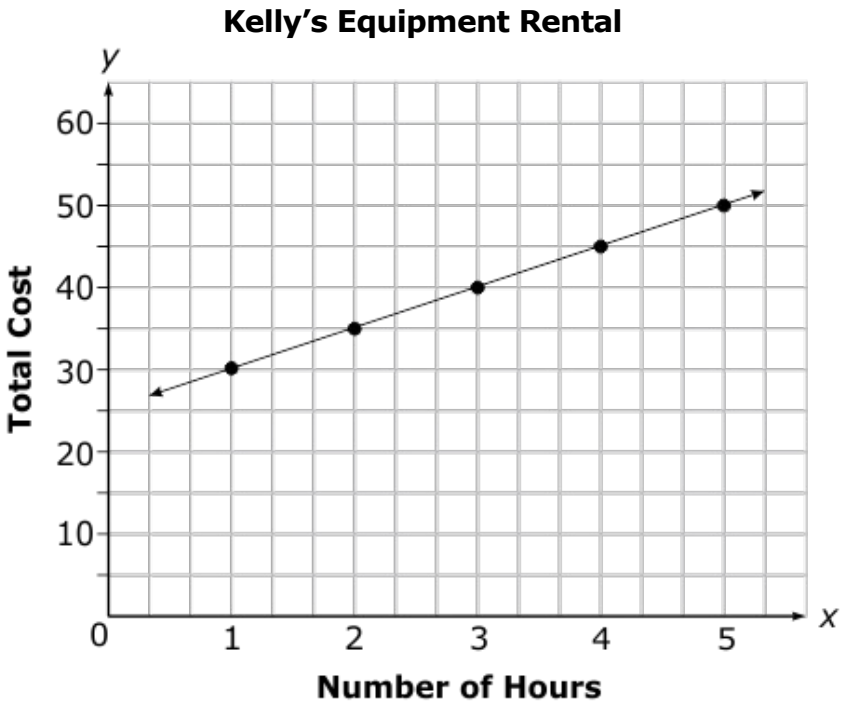
A. Martin has $4.00 less in his savings account than Suzie.

B. Suzie has $4.00 less in her savings account than Martin.

C. Martin has $10.00 less in his savings account than Suzie.

D. Suzie has $10.00 less in her savings account than Martin.

53. Kelly's Equipment Rental and Wendy's Watersports charge by the hour to rent a kayak. The graph below shows the total cost to rent a kayak from Kelly's Equipment Rental based on different numbers of hours.



The total costs to rent a kayak from Wendy's Watersports are listed in the table below.

Wendy's Watersports

Hours	Cost
2	$35
5	$65
7	$85

Who charges less per hour, and by how much?

A. Kelly's Equipment Rental charges $10 less per hour.

B. Wendy's Watersports charges $10 less per hour.

C. Kelly's Equipment Rental charges $5 less per hour.

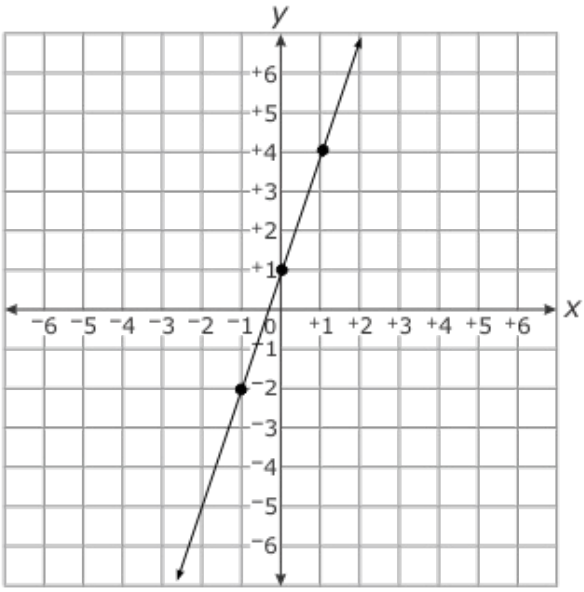
D. Wendy's Watersports charges $5 less per hour.

54. The table and graph below represent two different functions.

Function 1

x	*y*
3	−12
1	−2
0	3

Function 2



What is the difference between the slopes of the two functions?

A. 4

B. 3

C. 2

D. 1

55. **A soccer team is having a fundraiser by selling raffle tickets. Each ticket costs $2. For every 3 tickets purchased, there is a $1 discount. Which table displays the total price for the number of tickets purchased?**

A. **Ticket Prices**

Number of Tickets Purchased	2	3	4	5	6	7	8	9
Total Price $	2	3	5	7	8	10	12	13

B. **Ticket Prices**

Number of Tickets Purchased	2	3	4	5	6	7	8	9
Total Price $	4	6	8	10	12	14	16	18

C. **Ticket Prices**

Number of Tickets Purchased	2	3	4	5	6	7	8	9
Total Price $	4	5	7	9	10	12	14	15

D. **Ticket Prices**

Number of Tickets Purchased	2	3	4	5	6	7	8	9
Total Price $	3	5	6	8	9	11	12	14

56. **The Semmes Library will raise funds by selling bumpers stickers. The equation $p = 2s - 20$ is used to calculate the profit the library earns (p) if a certain number of bumper stickers (s) are sold. Which table has values that correspond to the equation?**

A. Fundraiser Profit

Stickers Sold	Profit ($)
10	40
11	42
12	44
13	46

B. Fundraiser Profit

Stickers Sold	Profit ($)
1	2
2	4
3	6
4	8

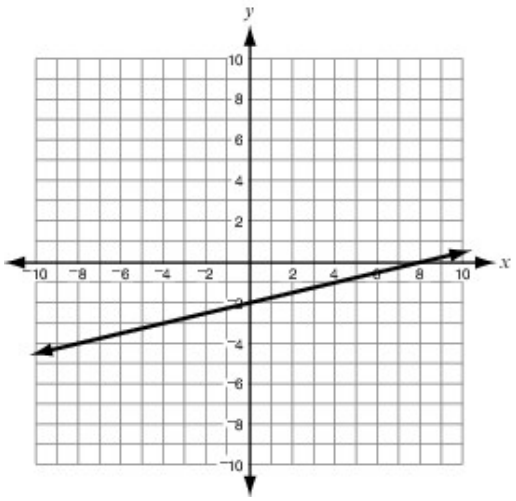
C. Fundraiser Profit

Stickers Sold	Profit ($)
1	18
2	16
3	14
4	12

D. Fundraiser Profit

Stickers Sold	Profit ($)
10	0
12	4
14	8
16	12

57. Compare the slope and y-intercept of the graph below with the slope and y-intercept of the equation $y = -4x$.



Compared with the equation, which statement is true about the graph?

A. The graph has a smaller slope and a lower y-intercept.

B. The graph has a larger slope and a higher y-intercept.

C. The graph has a larger slope and a lower y-intercept.

D. The graph has a smaller slope and a higher y-intercept.

58. Laura's cell phone service costs $65 per month, plus an additional $0.10 per text message sent. The table below shows the cost for Zach's cell phone service based on the number of texts messages he sends.

Number of Texts (x)	**Total Cost** (y)
20	$50.00
50	$57.50
100	$70.00

How much cheaper is Zach's cell phone service than Laura's when no text messages are sent?

A. $15

B. $20

C. $35

D. $40

59. **Using the pattern in this table, what should be the units digit for 2^{100}?**

Number	2^1	2^2	2^3	2^4	2^5	2^6
Value	2	4	8	16	32	64
Units digit	2	4	8	6	2	4

A. 2
B. 4
C. 6
D. 8

60. Two different fitness centers charge a one-time membership fee, plus a monthly charge to use the facilities. Fitness center A charges a membership fee of $100, plus $45 per month. The table below shows the cost of fitness center B after a certain number of months of use.

Fitness Center B

Months	Cost for Members
1	$117
3	$221
5	$325

What is the difference between the membership fees at the 2 fitness centers?

A. $17
B. $20
C. $35
D. $48

61. **Which equation could produce all the values shown in the table?**

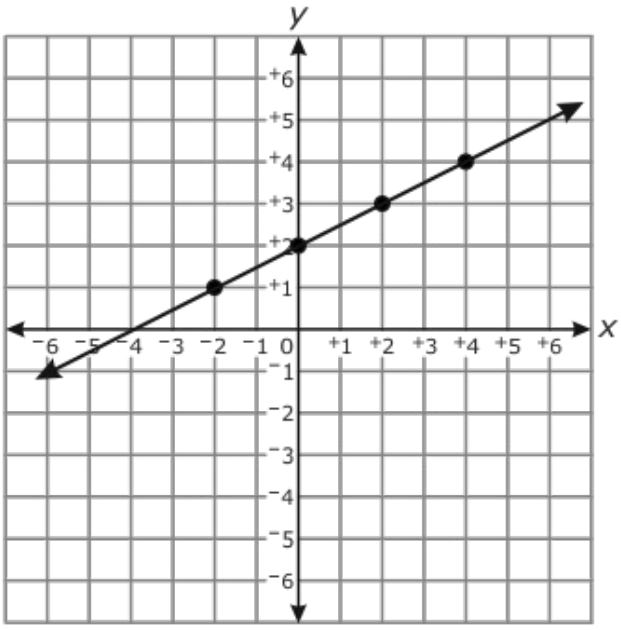
x	y
–1	2
2	5
8	65

A. $y = -2x$
B. $y = 2x^2 - 3$
C. $y = 8x + 1$
D. $y = x^2 + 1$

62. Function *V* contains the points in the table below.

x	***y***
3	6
5	10
7	14

Function *W* is shown on the graph below.



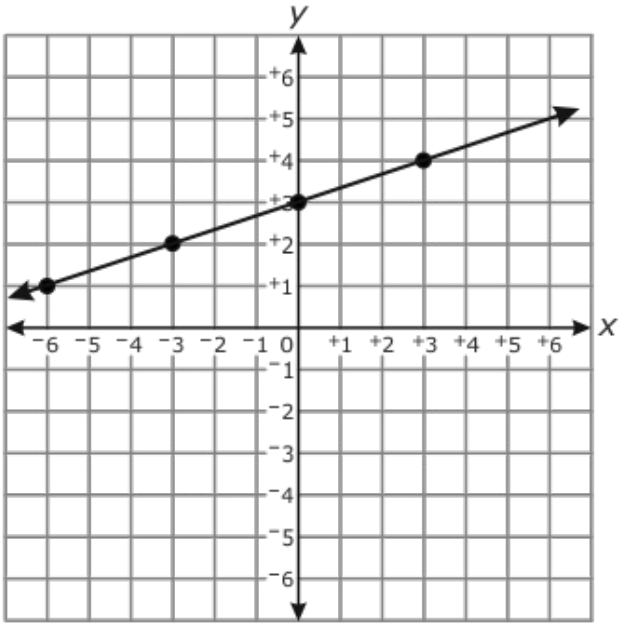
What is the difference in the *y*-intercepts of the two functions?

A. 0

B. 1

C. 2

63. Function R is represented by the equation $y = x + 3$. Function S is shown on the graph below.



Which statement is true?

A. Both functions have the same slope.

B. Both functions have the same y-intercept.

C. The slope of function S is greater than the slope of function R.

64. Susan’s Scooter Rentals charges a $75 deposit, plus $35 per hour. Carol’s Scooter Rentals charges their customers based on the table below.

Carol’s Scooter Rentals

Hours (x)	**Customer Charges** (y)
2	$145
4	$215
6	$285

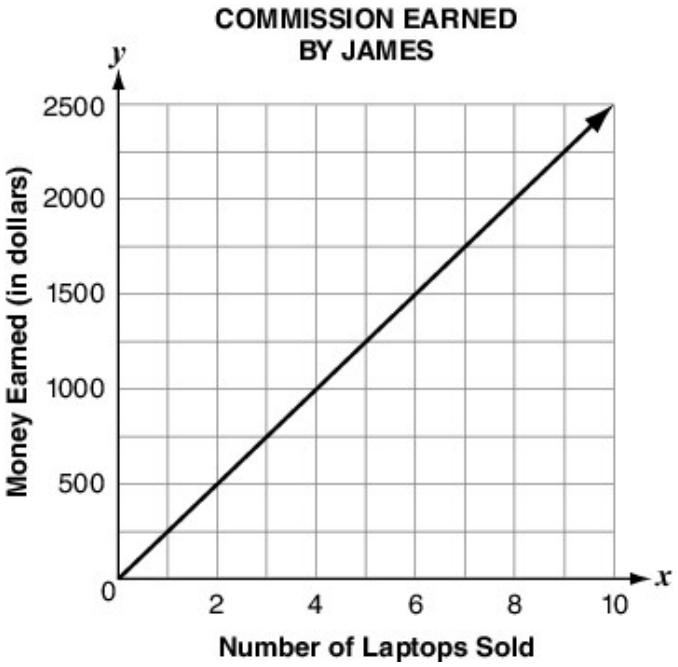
Which statement is true?

A. Susan’s Scooter Rentals charges $5 more per hour than Carol’s Scooter Rentals.

B. Carol’s Scooter Rentals charges $5 more per hour than Susan’s Scooter Rentals.

C. Both scooter rental companies charge the same amount.

65. Rhoda and James both sell laptops and earn commission based on the number of laptops sold. In one month, Rhoda earns $2000 in commission for selling 10 laptops and has a base salary of $600. The money James earns for selling laptops in the same month is shown in the graph below.



Which of these statements is **true** of the money Rhoda and James earn for selling laptops?

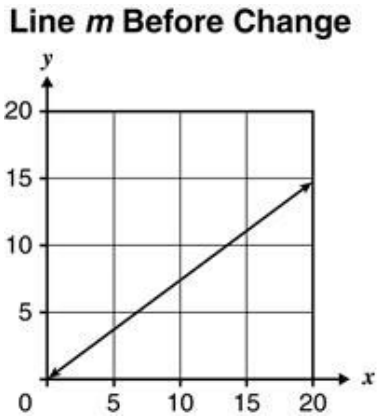
A. Rhoda earns $10 more than James for selling 10 laptops during the month.

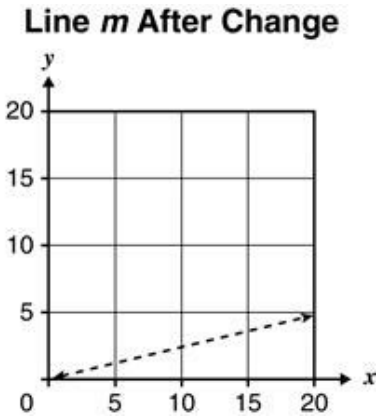
B. James earns $500 more than Rhoda for selling 10 laptops during the month.

C. James earns $50 more in commission than Rhoda for each laptop sold.

D. Rhoda earns $600 more in commission than James for each laptop sold.

66. **The graphs below shows a change in the slope of the Line *m* from $\frac{3}{4}$ to $\frac{1}{4}$.**

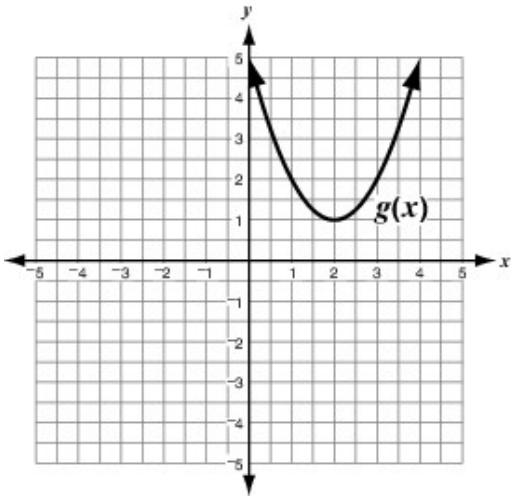




Which statement is true for the value of *y* when *x* has a value of 12?

A. The value of *y* increased from 1 to 3.
B. The value of *y* decreased from 3 to 1.
C. The value of *y* increased from 3 to 9.
D. The value of *y* decreased from 9 to 3.

67. A quadratic function, $f(x)$, intersects the x-axis at -3 and 1 and passes through the point $(2, 10)$. The graph of another quadratic function, $g(x)$, is shown below.



Which statement is true?

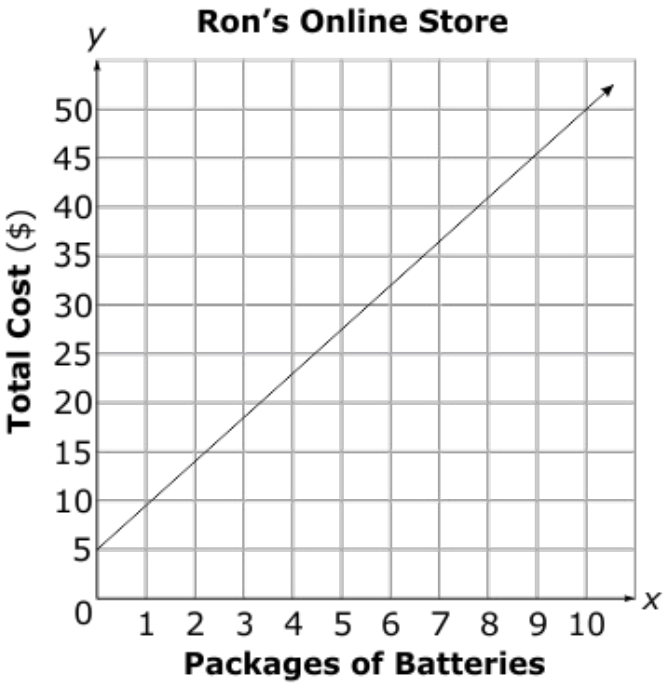
A. The minimum of $f(x)$ is 3 units less than the minimum of $g(x)$.

B. The minimum of $f(x)$ is 8 units less tha the minimum of $g(x)$.

C. The minimum of $f(x)$ is 9 units less than the minimum of $g(x)$.

D. The minimum of $f(x)$ is 11 units less than the minimum of $g(x)$.

68. Venture Battery Store charges a flat fee of $5.00 per package of batteries, plus $4.00 for shipping. Ron's Online Store uses the graph below to determine the total cost for each shipment of a package of batteries.



Which store charges less if a customer places an order for 7 packages of batteries, and by how much less?

A. Venture Battery Store charges $2.50 less than Ron's Online Store.

B. Ron's Online Store charges $2.50 less than Venture Battery Store.

C. Venture Battery Store charges $2.00 less than Ron's Online Store.

D. Ron's Online Store charges $2.00 less than Venture Battery Store.

69. Jon and Brianna were racing remote control cars. The equation $d = 3t + 15$ models the distance, d (in feet), Jon's car was away from a wall, after t seconds. The table below shows the distance that Brianna's car was away from the same wall at different times.

Seconds (t)	**Feet from Wall** (d)
5	20
10	30
15	40

How much closer to the wall did Brianna's car start compared to Jon's car?

A. 1 ft

B. 2 ft

C. 5 ft

D. 10 ft

70. One function can be represented by $f(x) = 2x + 3$. Three values of another function, $g(x)$, are given in the table below. The domains of both functions are all real numbers.

x	$g(x)$
2	−4
4	−5
6	−6

Which statement **best** compares the functions?

A. The functions represent parallel lines.

B. The functions represent the same line.

C. The functions represent perpendicular lines.

D. The functions represent intersecting lines that are not perpendicular.

71. Bob's Carpet Cleaning Company uses the equation $y = 22x + 30$ to calculate cost, y, to clean x number of rooms. Andy's Carpet Cleaning Company uses the table below to calculate the cost to clean rooms.

Andy's Carpet Cleaning Company

Number of Rooms (x)	**Total Cost** (y)
2	$75
4	$115
7	$175

Laura needs 5 rooms cleaned. Which company charges less and by how much less?

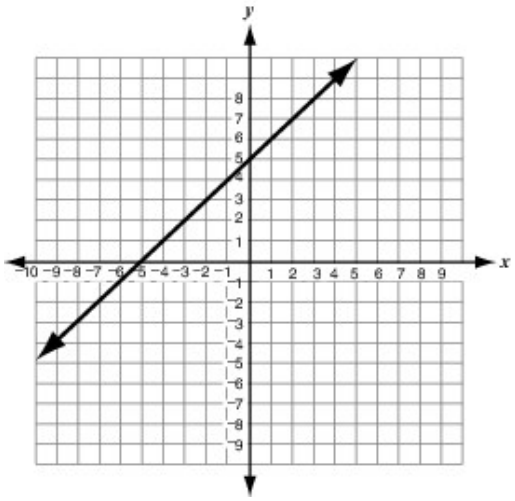
A. Bob's Carpet Cleaning charges $5.00 less than Andy's Carpet Cleaning.

B. Andy's Carpet Cleaning charges $5.00 less than Bob's Carpet Cleaning.

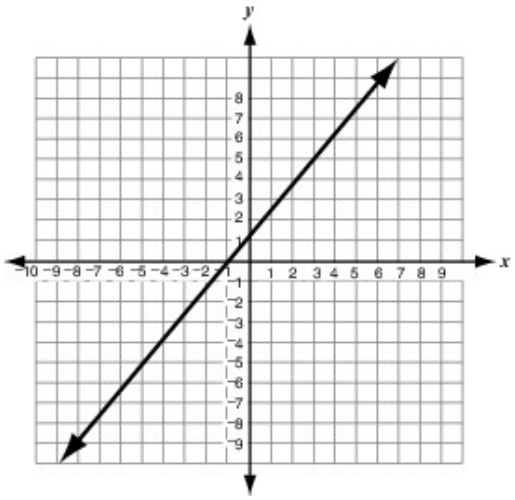
C. Bob's Carpet Cleaning charges $1.00 less than Andy's Carpet Cleaning.

72. Which graph represents a function with a greater rate of change than the equation $y = 2x - 3$?

A.



B.



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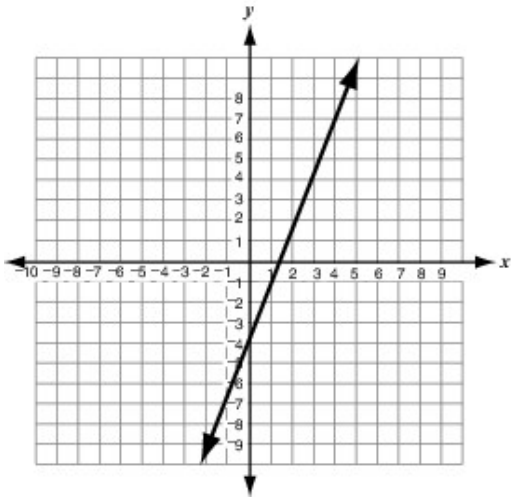

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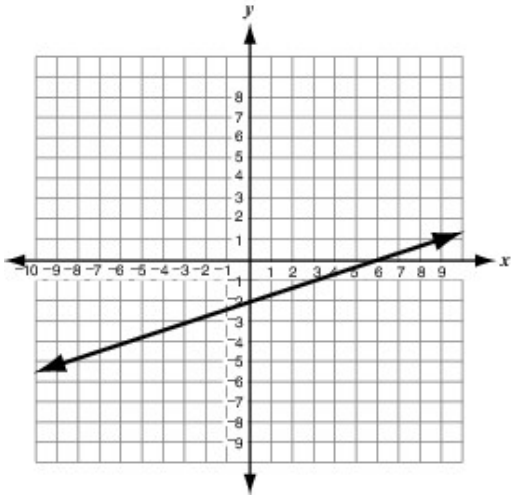


73. Pete's Plumbing charges a flat fee of $28 for a house call and inspection and an additional $35 per hour for any onsite work. Which table represents a cost function with a greater hourly rate than these charges?

A.

Hours Worked	Total Charge (in dollars)
3	109
5	163
7	217

B.

Hours Worked	Total Charge (in dollars)
3	136
5	208
7	280

C.

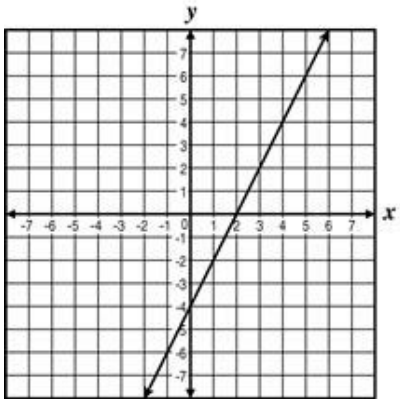
Hours Worked	Total Charge (in dollars)
6	174
9	261
12	348

D.

Hours Worked	Total Charge (in dollars)
6	209
9	296
12	383

74. **Which line appears to have the same slope as the equation $x - y = 4$ and has a *y*-intercept that is 2 units above the *y*-intercept of the given equation?**

A.



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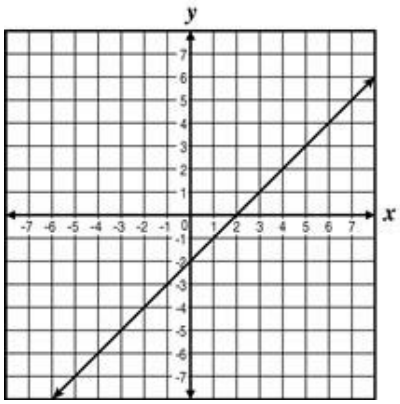
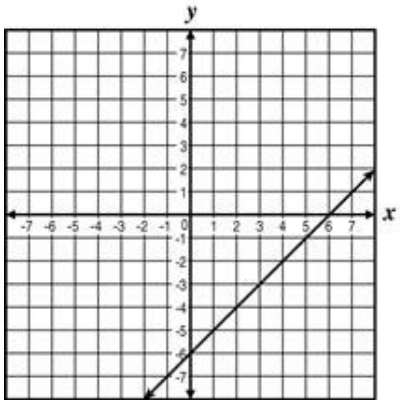


C.



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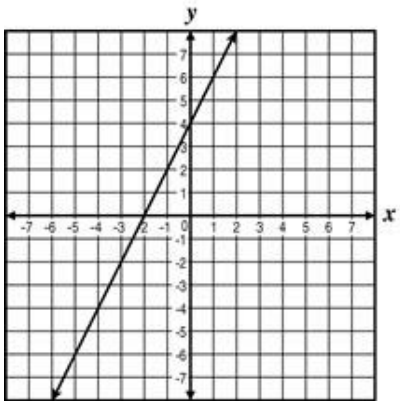
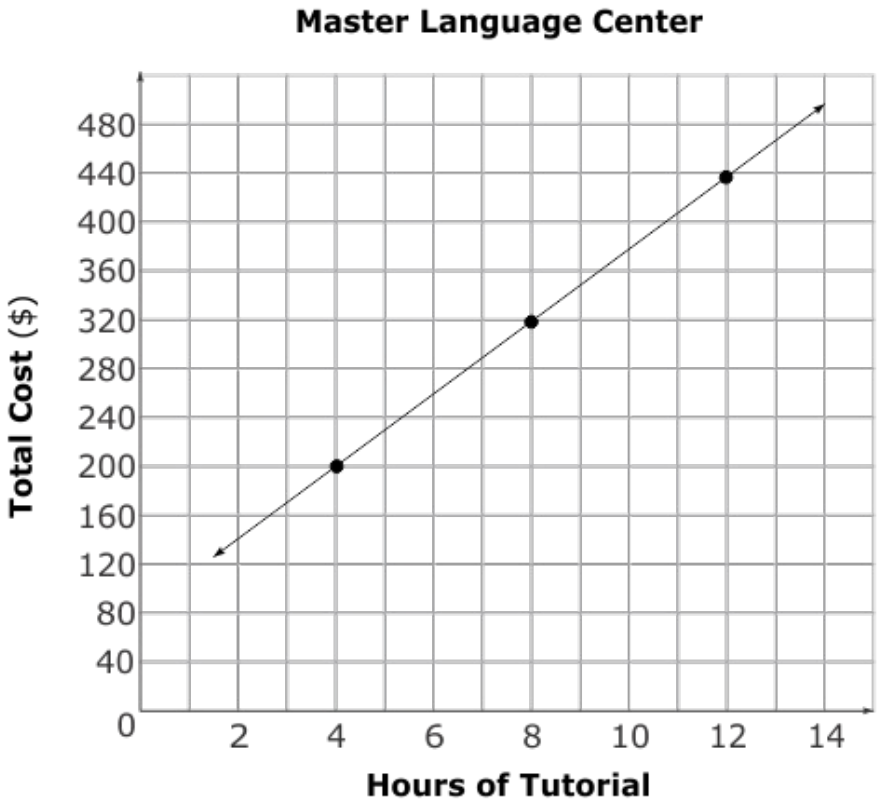


75. Quick Language Center and Master Language Center are two centers that teach second languages. Both language centers charge a one-time

registration fee and an hourly tutorial rate. The cost to use Quick Language Center is represented in the table below.

Tutorial Rate (hour)	**Cost** ($)
3	157.50
7	287.50
12	450.00

The cost to use Master Language Center is represented in the graph below.



Which language center charges less for the registration fee, and by how much less?

A. Quick Language Center charges $2.50 less on the registration fee than Master Language Center.

B. Master Language Center charges $2.50 less on the registration fee than Quick Language Center.

C. Quick Language Center charges $20.00 less on the registration fee than Master Language Center.

D. Master Language Center charges $20.00 less on the registration fee than Quick Language Center.

76. Art classes at Studio A cost $15 per class, plus a one-time fee of $20. The following functions represent the total cost, *y*, of taking *x* art classes at four other studios. Which function represents the studio with a cost per class **greater** than Studio A?

A. $y = 12x + 25$

B. $y = 14x + 11$

C. $y = 15x + 14$

D. $y = 18x + 12$

77. Two stores sell used DVDs. Both stores charge a flat fee for shipping, plus the same price for any used DVD. Store A charges a total of $20.99 for 4 used DVDs and $32.99 for 7 used DVDs. Store B's costs are represented in the table below.

Store B

Number of DVDs	**Total Cost** ($)
4	20.99
6	29.49
9	42.24

Which statement is true?

A. Store A charges $0.25 more per DVD than Store B.

B. Store A charges $1.00 more for shipping than Store B.

C. Store B charges $0.25 more for shipping than Store A.

D. Store B charges $1.00 more per DVD than Store A.

78. Mermaid Swimming Club uses the equation $w = 25h + 40$ to calculate the total cost, w, of h hours of swim lessons. Dolphin Swimming Club uses the table below to calculate the cost of swimming lessons for its customers.

Hours (h)	**Total Cost** (w)
2	$110
4	$155
6	$200

For 7 hours of swimming lessons, which club is less expensive and by how much?

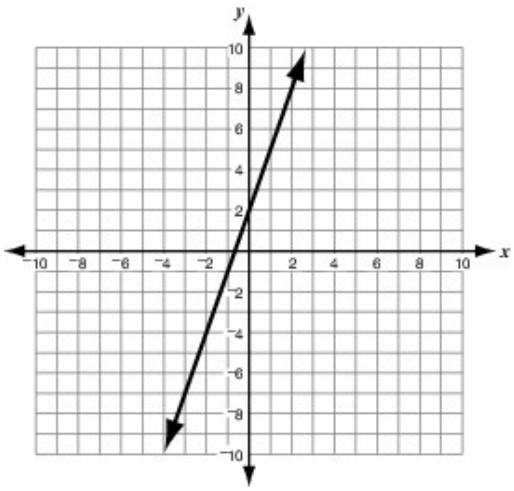
A. Dolphin Swimming Club, by $2.50

B. Mermaid Swimming Club, by $2.50

C. Dolphin Swimming Club, by $7.50

D. Mermaid Swimming Club, by $7.50

79. Consider the functions represented by the graph and table shown below.



x	1	2	3	4
y	8	12	16	20

Which statement is **true** of these functions?

A. The rate of change of the function in the graph is more than that of the function in the table by 2 units.

B. The rate of change of the function in the graph is less than that of the function in the table by 2 units.

C. The rate of change of the function in the graph is more than that of the function in the table by 1 unit.

D. The rate of change of the function in the graph is less than that of the function in the table by 1 unit.

80. The equation of function A is $y = 3x - 7$. Function B contains the points in the table below.

x	y
-2	13
2	-1
4	-5

Given the two functions, which is a true statement?

A. The slope of function A is greater than the slope of function B.

B. The slope of function A is the same as the slope of function B.

C. The x-intercept of function A is less than the x-intercept of function B.

D. The y-intercept of function A is greater than the y-intercept of function B.

81. **Based on the pattern shown in the table below, what is the ones digit of 2^{2003}?**

n	2^n
1	2
2	4
3	8
4	16
5	32
6	64

A. 2
B. 4
C. 6
D. 8

82. Tom's Lawn Maintenance company charges a flat fee of $20 for a service call, plus $9.50 per hour to cut grass. Rachel's Lawn Maintenance company uses the table below to determine the total cost of cutting grass.

Rachel's Lawn Maintenance

Number of Hours (x)	**Total Cost** (y)
1	$27.50
3	$47.50
5	$67.50
7	$87.50

Which lawn maintenance company charges less for a service call, and by how much less?

A. Tom's Lawn Maintenance company charges $2.50 less for the service call.

B. Rachel's Lawn Maintenance company charges $2.50 less for the service call.

C. Tom's Lawn Maintenance company charges $0.50 less for the service call.

D. Rachel's Lawn Maintenance company charges $0.50 less for the service call.

83. Function 1 is represented by the equation $y = 6\left(\frac{1}{2}\right)^x$. Function 2 is represented by the equation $y = 3(4)^x$. Which statement is true?

A. Both functions show exponential decay.

B. Both functions show exponential growth.

C. Function 1 shows exponential growth, and function 2 shows exponential decay.

D. Function 1 shows exponential decay, and function 2 shows exponential growth.

84. Jenna charges $25 to babysit one child and $5 for each additional child. Tyler's babysitting rates are shown in the table below.

Number of Children	Cost to Babysit
2	$36
3	$42
4	$48

How much more does Tyler charge to babysit one child than Jenna charges to babysit one child?

A. $4

B. $5

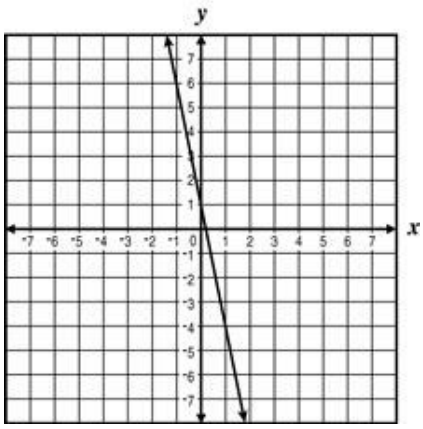
C. $6

85. **The table of values represents a linear function.**

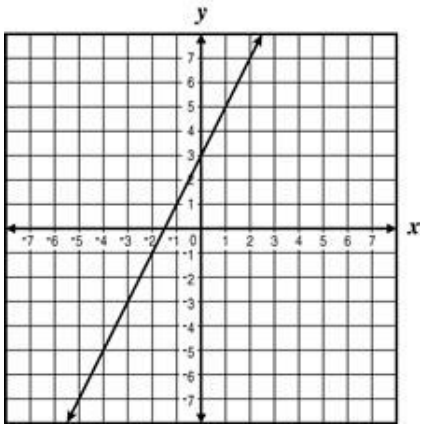
x	*y*
−1	−2
3	14

Which graph appears to have a line that is steeper than the line represented by the table of values?

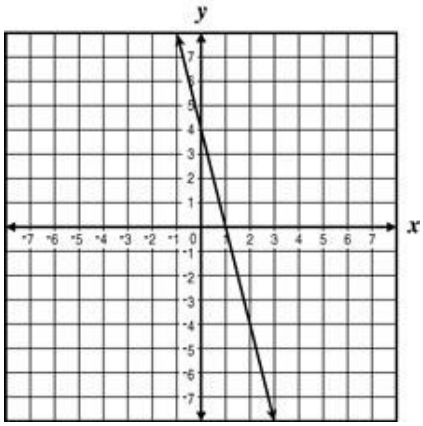
A.



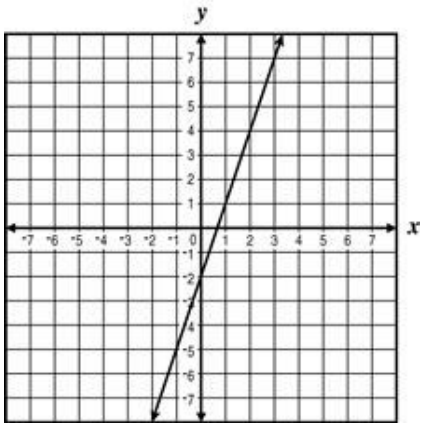
B.



C.



D.



86. Ronaldo's Heating and Cooling company uses the equation, $y = 35x + 39.99$ to calculate the cost, y, of working on equipment x number of hours. Brennan's Heating and Cooling company uses the table below to calculate the cost of working on equipment for different numbers of hours.

Brennan's Heating and Cooling

Working Hours (x)	**Total Cost** (y)
2	$114.99
4	$179.99
6	$244.99

If it takes 5 hours to work on equipment, which heating and cooling company charges less and by how much less?

A. Ronaldo's Heating and Cooling company charges $2.50 less for 5 hours of work.

B. Brennan's Heating and Cooling company charges $2.50 less for 5 hours of work.

C. Ronaldo's Heating and Cooling company charges $5.00 less for 5 hours of work.

D. Brennan's Heating and Cooling company charges $5.00 less for 5 hours of work.

87. Simon saves money according to the equation $y = 25 + 10x$, where y is his total savings and x is the number of weeks he has been saving. Diane's savings are shown in the table below.

Weeks Saved (x)	**Total Money Saved** (y)
0	$50.00
1	$55.00
2	$60.00
3	$65.00
4	$70.00
5	$75.00
6	$80.00
7	$85.00
8	$90.00

After how many weeks will Simon first have more money saved than Diane?

A. 4

B. 5

C. 6

D. 7

88. Jack's taxi service charges $3.00 for pick up and $2.00 per mile driven. The rates for Taylor's taxi service are shown in the table below.

Taylor's Taxi Service

Miles Driven (x)	**Cost** (y)
2	$8.00
5	$17.00
7	$23.00

Suzanne needs a taxi for 10 miles. Which taxi service will cost less, and by how much?

A. Jack's taxi service is less by $6.

B. Taylor's taxi service is less by $9.

C. Jack's taxi service is less by $9.

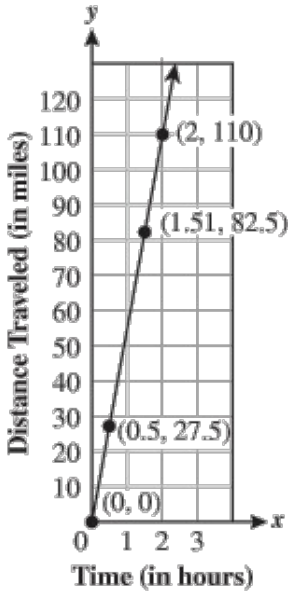
89. Which representation shows a rate that is less than 60 miles per hour?

A.

Time (in hours)	Distance (in miles)
0.5	30
1.5	90
2.0	120

B. $y = 70x$, where x represents time in hours and y represents distance in miles

C.



D. A line that passes through the origin and has a slope of 65

90. Consider the two linear functions represented by the equation and the table below.

Function 1:

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

Function 2:

x	y
−10	−25
−6	−17
−3	−11

Part A. Do either of the functions have a negative slope? Explain your answer.

Part B. Which function has a greater rate of change? Explain your answer.

Use words, numbers, and/or pictures to show your work.

91. Kevin is looking at bicycle rental companies to use while he is on vacation. Company 1 charges $4.50 per hour, plus a one-time fee of $9. The table below shows the total cost to rent a bicycle for different amounts of time from Company 2.

Company 2

Number of Hours (x)	**Total Cost** (y)
2	$18.00
4	$29.00
6	$40.00

Which statement is true?

A. Company 1 charges $1 less per hour than Company 2.

B. Company 1 charges $1 more per hour than Company 2.

C. Company 1 charges $2 less per hour than Company 2.

D. Company 1 charges $2 more per hour than Company 2.

92. **Which table contains only coordinates that satisfy the equation** $y = 3x^2 - 4$?

A.

x	*y*
–2	–16
–1	–7
0	–4
1	–1
2	–8

B.

x	*y*
–2	–16
–1	–1
0	4
1	1
2	–16

C.

x	*y*
–2	–8
–1	–1
0	4
1	–1
2	–8

D.

x	*y*
–2	8
–1	–1
0	–4
1	–1
2	8

93. Two functions are represented below.

Function 1:

$4x - 2y = -2$

Function 2:

x	y
-1	3
0	1
1	-1
2	-3

Which statement is true about the *y*-intercepts of the functions?

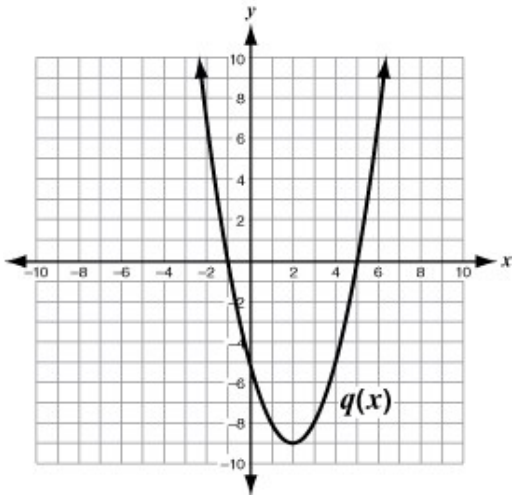
A. At least one of the functions does not have a y-intercept.

B. Function 1 and Function 2 have *y*-intercepts that are equal.

C. Function 1 has a *y*-intercept that is less than the *y*-intercept of Function 2.

D. Function 1 has a *y*-intercept that is greater than the *y*-intercept of Function 2.

94. Function $p(x)$ is defined as $p(x) = x^2 - 2x - 3$. The graph of function $q(x)$ is shown below.



Part A. Which function has a **minimum** value that is farther from the *x*-axis? Show your work.

Part B. Which function has the greater *y*-intercept? Show your work.

Part C. What are the roots of the two functions? Show your work.

Use words, numbers, and/or pictures to show your work.

95. **Which table of ordered pairs represents a line that has a slope that is the same as the slope of the line represented by the equation $y = 2x + 1$?**

A.

x	y
–2	7
3	–8

B.

x	y
–2	2
2	4

C.

x	y
–1	–7
4	3

D.

x	y
–2	2
4	–1

96.

97.

98.

99.

100.

101.