

Name \_\_\_\_\_ Date \_\_\_\_\_

## A Picture Is Worth a Thousand Words

### Understanding Quantities and Their Relationships

#### Vocabulary

Write a definition for each term in your own words.

1. independent quantity
2. dependent quantity

#### Problem Set

Determine the independent and dependent quantities in each scenario.

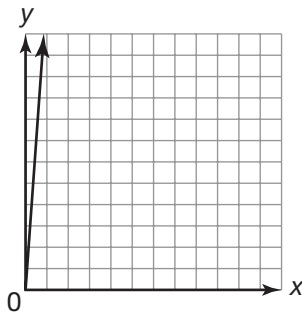
1. Selena is driving to visit her grandmother who lives 325 miles away from Selena's home. She travels an average of 60 miles per hour.  
Independent quantity: time (hours)  
Dependent quantity: distance (miles)
2. Benjamin works at a printing company. He is making T-shirts for a high school volleyball team. The press he runs can imprint 3 T-shirts per minute with the school's mascot.
3. On her way to work each morning, Sophia purchases a small cup of coffee for \$4.25 from the coffee shop.

4. Phillip enjoys rock climbing on the weekends. At some of the less challenging locations he can climb upwards of 12 feet per minute.
5. Jose prefers to walk to work when the weather is nice. He walks the 1.5 miles to work at a speed of about 3 miles per hour.
6. Gavin works for a skydiving company. Customers pay \$200 per jump to skydive in tandem skydives with Gavin.

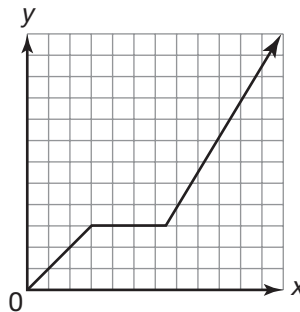
Choose the graph that best models each scenario.

7. Kylie is filling her backyard pool to get ready for the summer. She is using a garden hose to fill the pool at a rate of 14 gallons per minute.

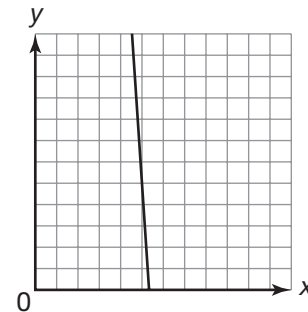
Graph A



Graph B



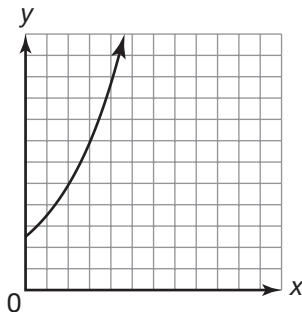
Graph C



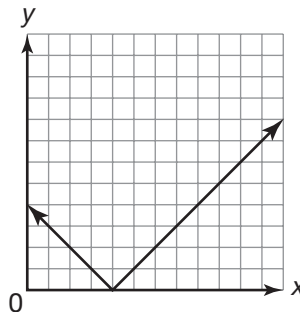
Graph A

8. Hector is training to participate in competitive trampoline. In his best jump, he can reach a maximum height of about 9 meters and can spend about 2 seconds in the air performing tricks.

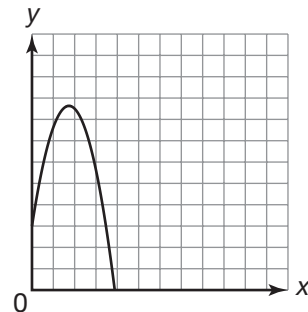
Graph A



Graph B



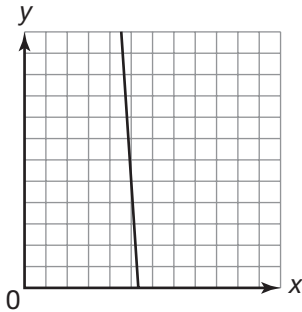
Graph C



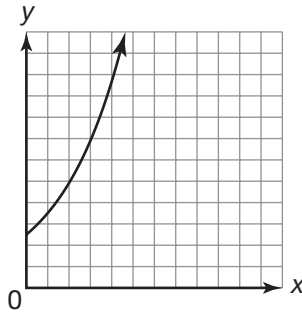
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9. Jasmine is saving for college. She has invested \$500 in a mutual fund that is expected to earn an average of 7% annually.

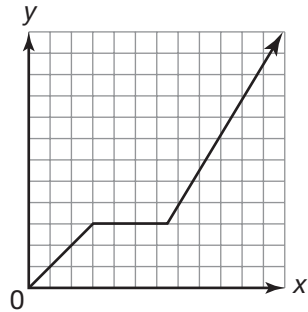
Graph A



Graph B

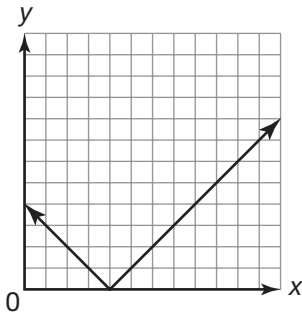


Graph C

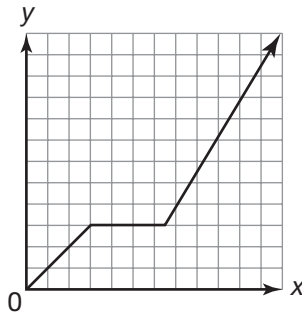


10. Each day Maria starts her walk to school at 7:45 AM. At 7:50 AM she stops at her friend Jenna's house. Jenna is usually late and Maria must wait at least 5 minutes for her to get ready. At 7:55 AM Maria and Jenna leave Jenna's house and arrive at school at 8:10 AM.

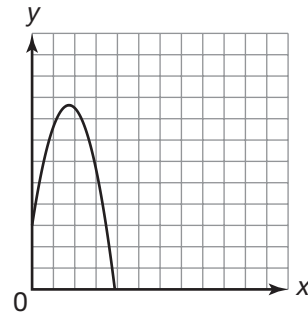
Graph A



Graph B

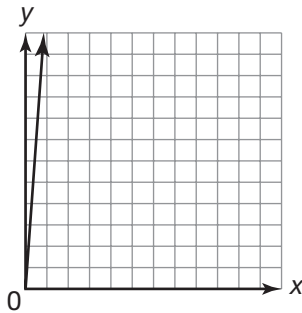


Graph C

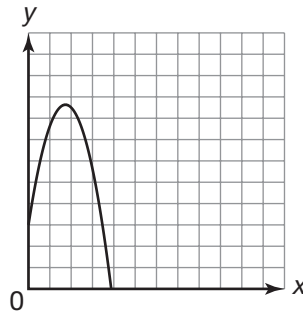


11. Marcus is at the top of an observation tower. He drops an action figure with a parachute attached and watches it descend to the ground.

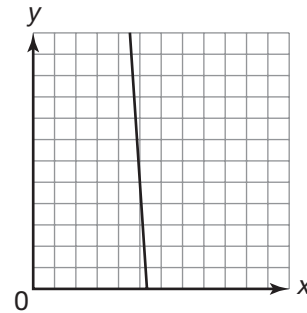
Graph A



Graph B

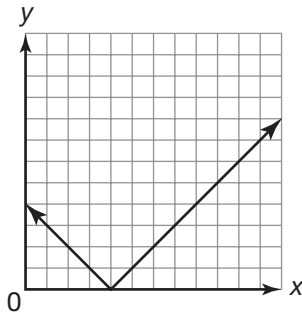


Graph C

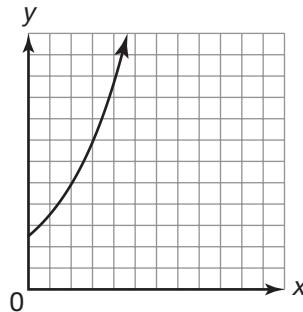


12. Janelle holds a raffle to raise money for a children's hospital. Participants who enter the raffle guess the number of peanuts in a jar. Janelle records the number of peanuts each participant guesses and the number of peanuts their guess is off by.

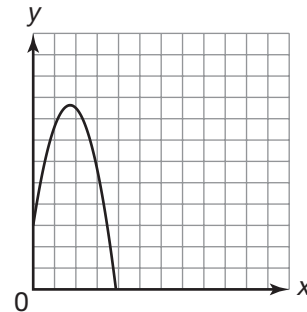
Graph A



Graph B



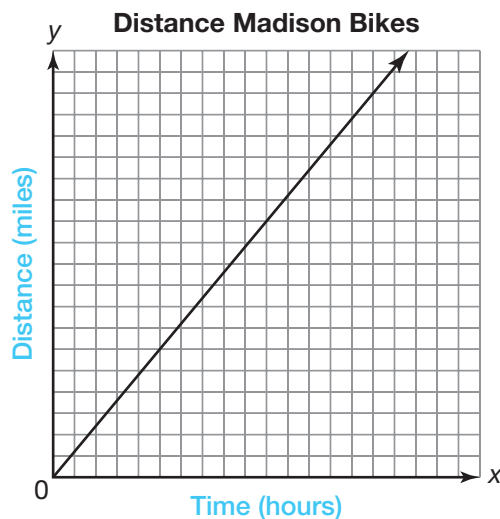
Graph C



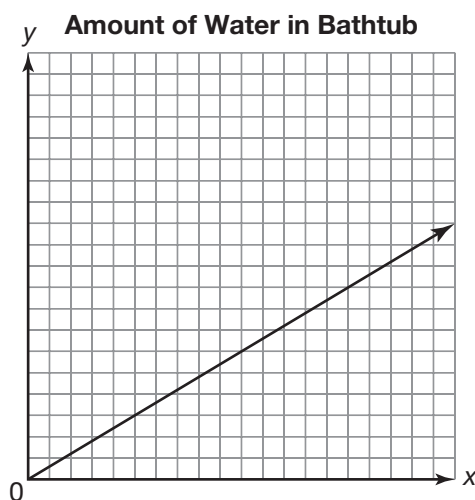
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Label the axes of the graph that models each scenario with the independent and dependent quantities.

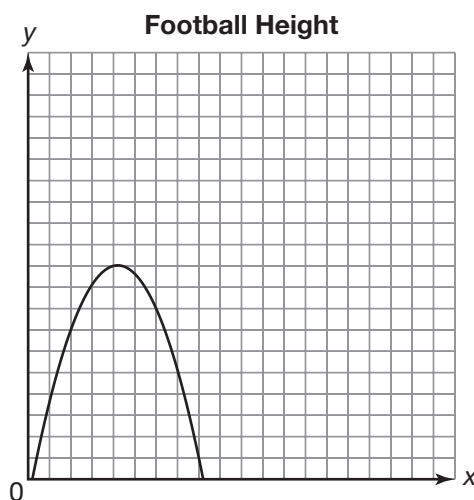
13. Madison enjoys bicycling for exercise. Each Saturday she bikes a course she has mapped out around her town. She averages a speed of 12 miles per hour on her journey.



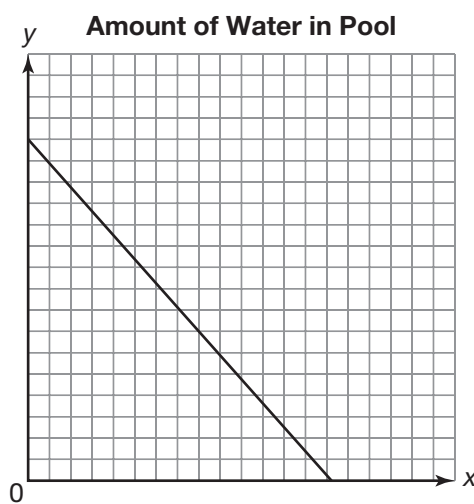
14. Natasha is filling the bathtub with water in order to give her dog Buster a bath. The faucet fills the tub at an average rate of 12 gallons per minute.



15. Marcus throws a football straight up into the air. After it reaches its maximum height of 20 feet, it descends back to the ground.

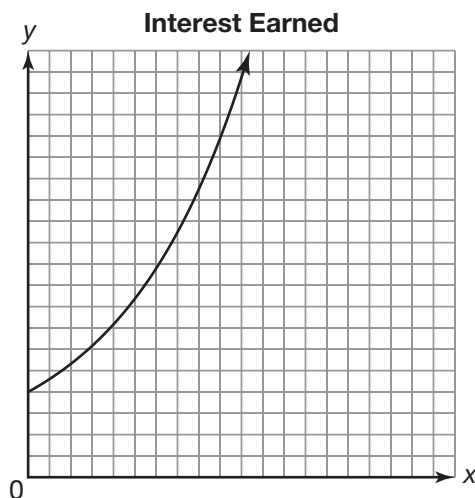


16. Chloe is using a pump to drain her backyard pool to get ready for winter. The pump removes the water at an average rate of 15 gallons per minute.

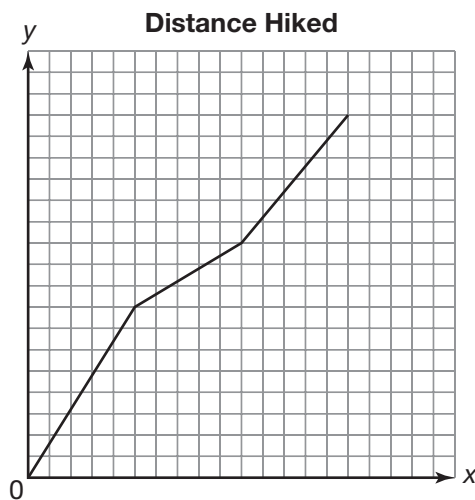


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17. Jermaine is saving money to purchase a used car. He places \$850 dollars in a savings account that earns 1.65% interest annually.



18. Zachary enjoys hiking. On the first day of his latest hiking trip, he hikes through flat terrain for about 8 miles. On the second day, he hikes through very steep terrain for about 3 miles. On the third day he hikes through some hilly terrain for about 6 miles.







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## A Sort of Sorts

### Analyzing and Sorting Graphs

#### Vocabulary

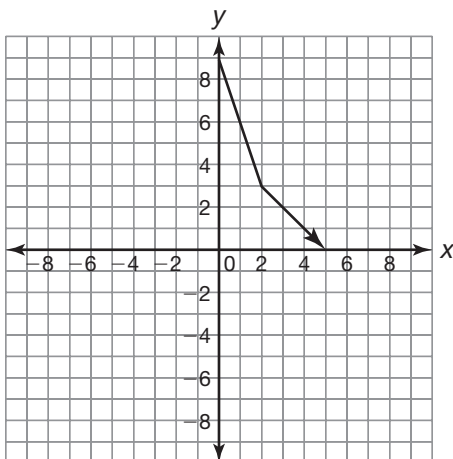
Match each definition to its corresponding term.

1. A graph with no breaks in it	a. discrete graph
2. The mapping between a set of inputs and a set of outputs	b. continuous graph
3. The set of all input values of a relation	c. relation
4. The set of all output values of a relation	d. function
5. A graph of isolated points	e. domain
6. A visual method used to determine whether a relation represented as a graph is a function	f. range
7. A relation between a given set of elements for which each input value there exists exactly one output value	g. Vertical Line Test

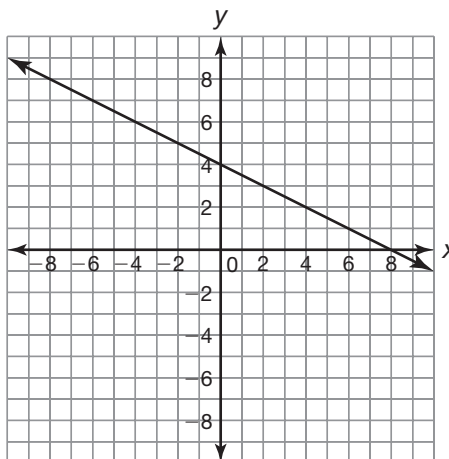
## Problem Set

Each pair of graphs has been grouped together. Provide a rationale to explain why these graphs may have been grouped together.

1. Graph A



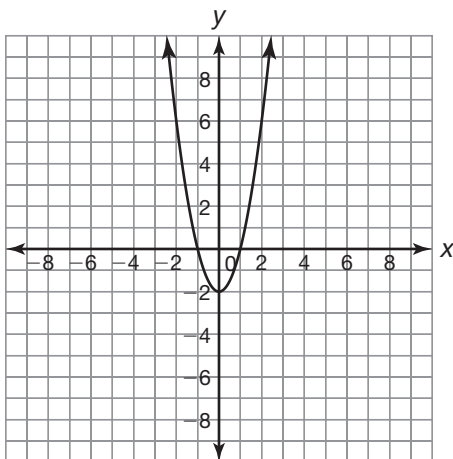
Graph B



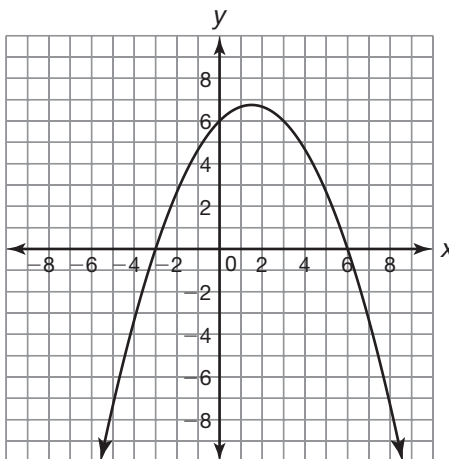
Answers will vary.

Both graphs are always decreasing from left to right. Both graphs are functions. Both graphs are made up of straight lines.

2. Graph A

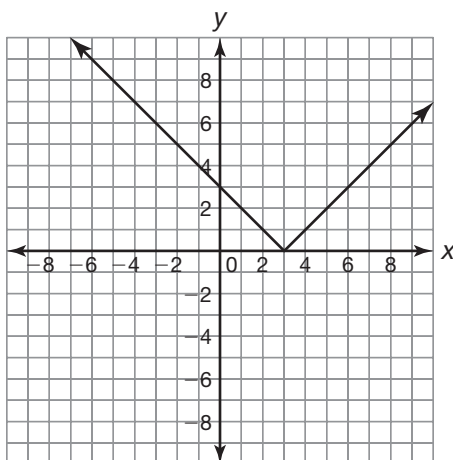


Graph B

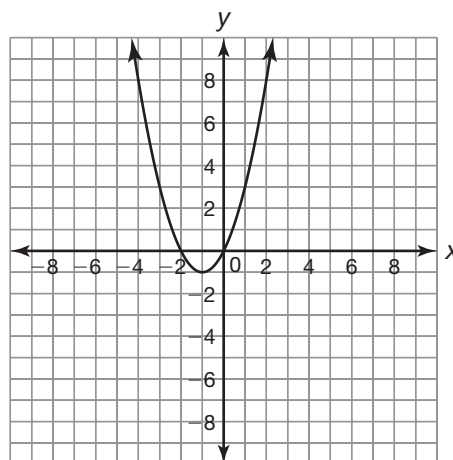


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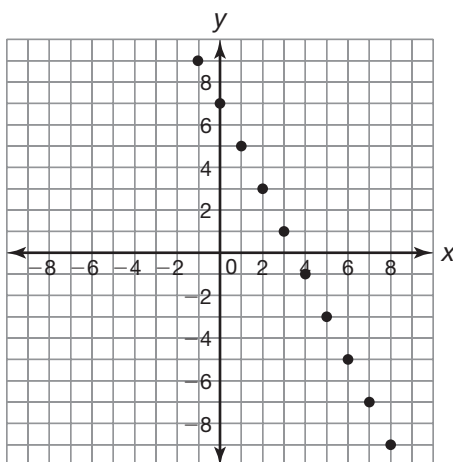
3. Graph A



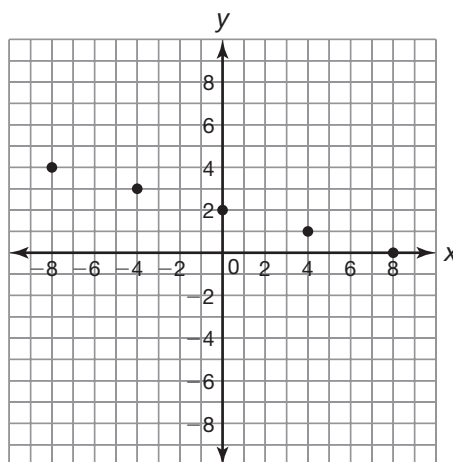
Graph B



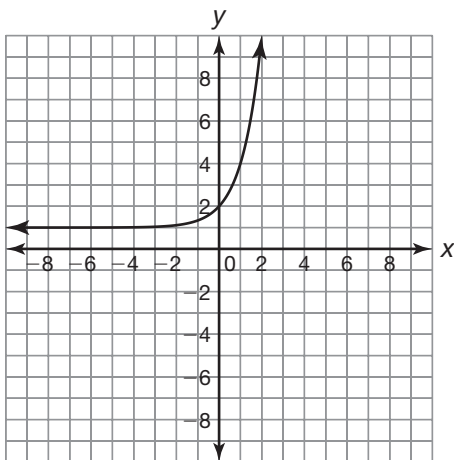
4. Graph A



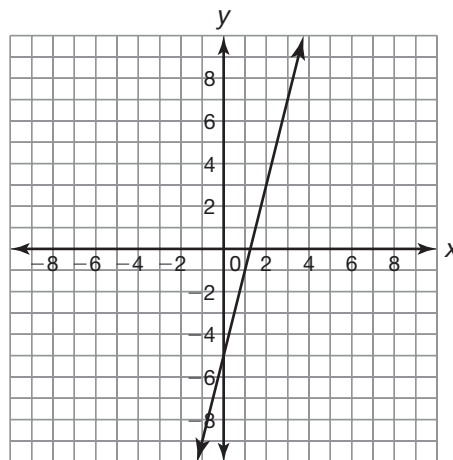
Graph B



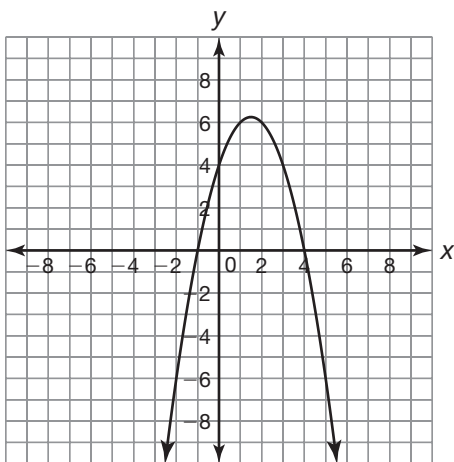
5. Graph A



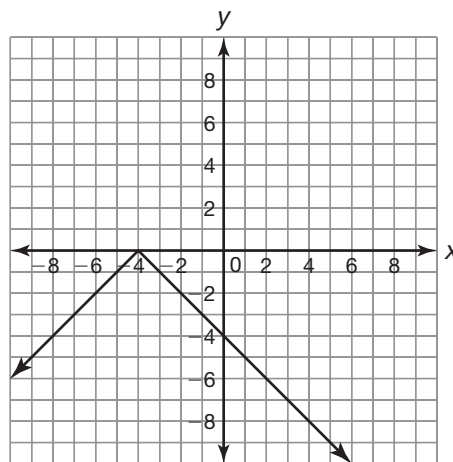
Graph B



6. Graph A



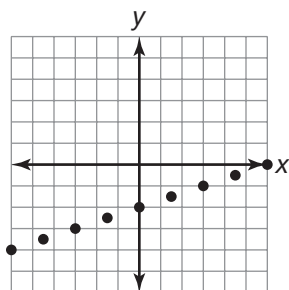
Graph B



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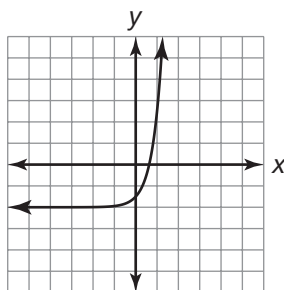
Determine whether the graph is discrete or continuous.

7.

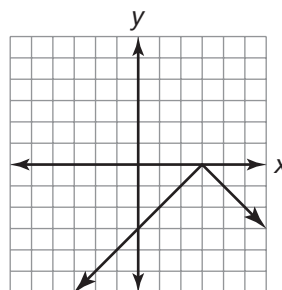


The graph is discrete.

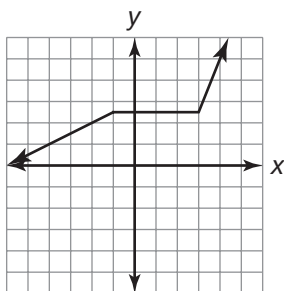
8.



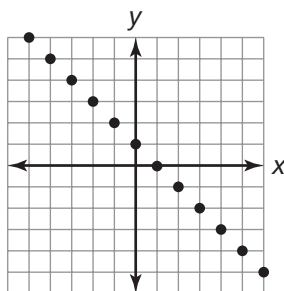
9.



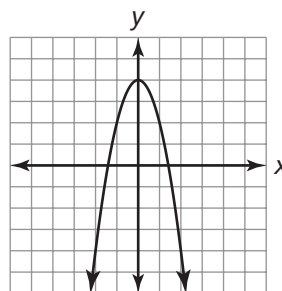
10.



11.

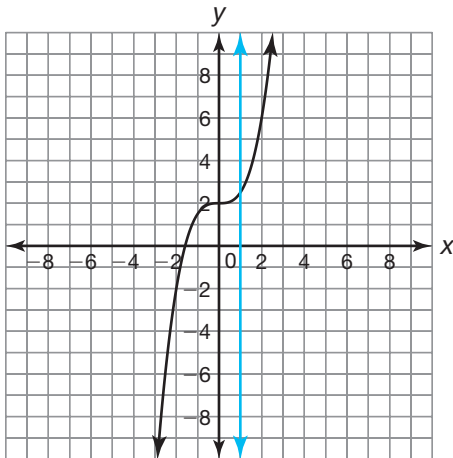


12.



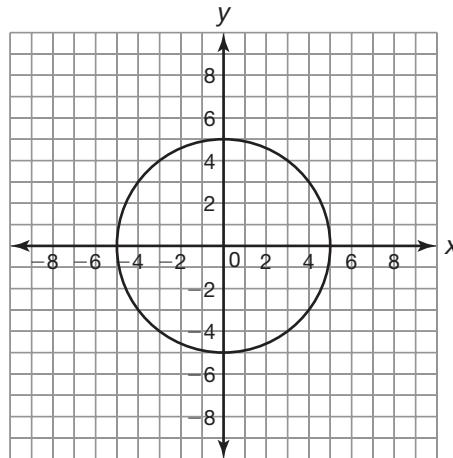
Determine if each graph represents a function by using the Vertical Line Test.

13.

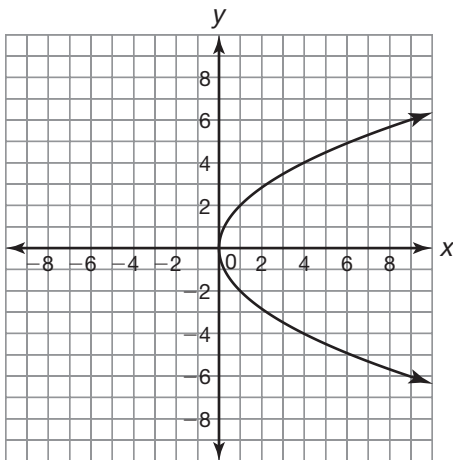


Yes. The graph is a function.

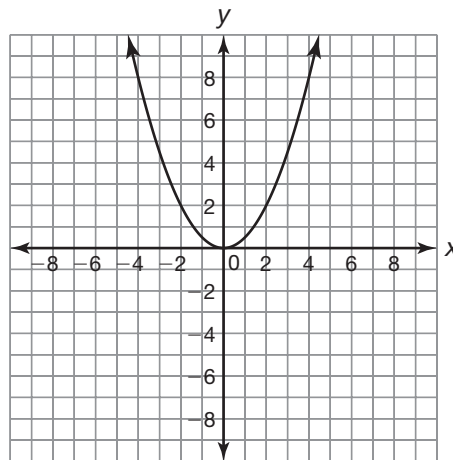
14.



15.

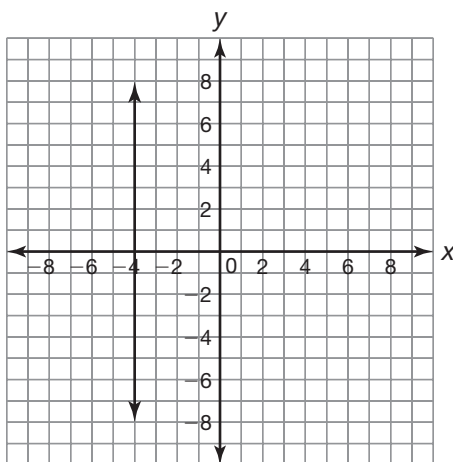


16.

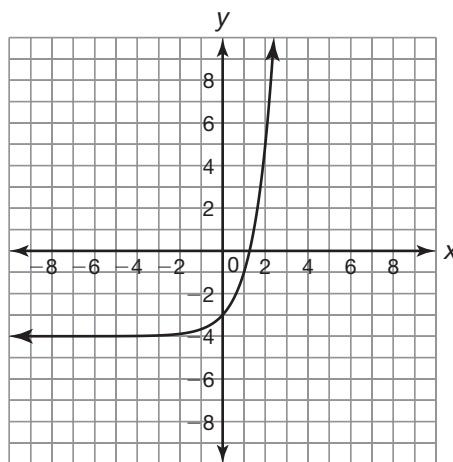


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17.



18.







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## There Are Many Ways to Represent Functions

### Recognizing Algebraic and Graphical Representations of Functions

#### Vocabulary

Choose the term from the box that best completes each statement.

function notation	increasing function	exponential functions
function family	linear functions	linear absolute value functions
absolute maximum	quadratic functions	constant function
linear piecewise functions	decreasing function	absolute minimum

- \_\_\_\_\_ is a way to represent equations algebraically that makes it more efficient to recognize the independent and dependent variables.
- The family of \_\_\_\_\_ includes functions of the form  $f(x) = a \cdot b^x$ , where  $a$  and  $b$  are real numbers, and  $b$  is greater than 0 but is not equal to 1.
- The family of \_\_\_\_\_ includes functions that have an equation that changes for different parts, or pieces, of the domain.
- When both the independent and dependent variables of a function increase across the entire domain, the function is called an \_\_\_\_\_.
- A function has an \_\_\_\_\_ if there is a point on its graph that has a  $y$ -coordinate that is greater than the  $y$ -coordinates of every other point on the graph.
- A \_\_\_\_\_ is a group of functions that share certain characteristics.
- The family of \_\_\_\_\_ includes functions of the form  $f(x) = a|x + b| + c$ , where  $a$ ,  $b$ , and  $c$  are real numbers, and  $a$  is not equal to 0.
- When the dependent variable of a function decreases as the independent variable increases across the entire domain, the function is called a \_\_\_\_\_.
- The family of \_\_\_\_\_ includes functions of the form  $f(x) = ax^2 + bx + c$ , where  $a$ ,  $b$ , and  $c$  are real numbers, and  $a$  is not equal to 0.
- The family of \_\_\_\_\_ includes functions of the form  $f(x) = ax + b$ , where  $a$  and  $b$  are real numbers, and  $a$  is not equal to 0.
- If the dependent variable of a function does not change or remains constant over the entire domain, then the function is called a \_\_\_\_\_.
- A function has an \_\_\_\_\_ if there is a point on its graph that has a  $y$ -coordinate that is less than the  $y$ -coordinates of every other point on the graph.

**Problem Set**

Rewrite each function using function notation.

1. Rewrite the function  $y = 3x - 8$  using function notation so that the dependent quantity, defined as  $f$ , is a function of the independent quantity  $x$ .

$$f(x) = 3x - 8$$

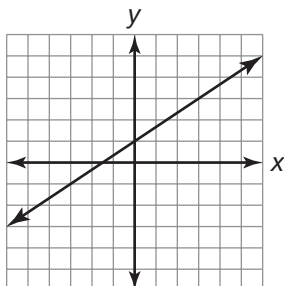
2. Rewrite the function  $y = 3x^2 + 6x - 1$  using function notation so that the dependent quantity, defined as  $C$ , is a function of the independent quantity  $x$ .
3. Rewrite the function  $y = 3^x + 8$  using function notation so that the dependent quantity, defined as  $P$ , is a function of the independent quantity  $x$ .
4. Rewrite the function  $l = |n - 2|$  using function notation so that the dependent quantity, defined as  $L$ , is a function of the independent quantity  $n$ .
5. Rewrite the function  $d = -\frac{1}{2}m + 5$  using function notation so that the dependent quantity, defined as  $A$ , is a function of the independent quantity  $m$ .
6. Rewrite the function  $c = 2\pi r^2$  using function notation so that the dependent quantity, defined as  $C$ , is a function of the independent quantity  $r$ .

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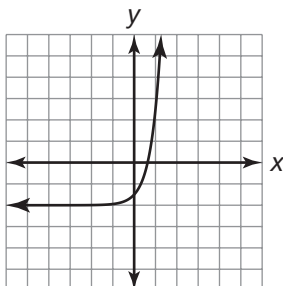
Choose the graph that represents each function. Use your graphing calculator.

7.  $f(x) = \frac{2}{3}x + 2$

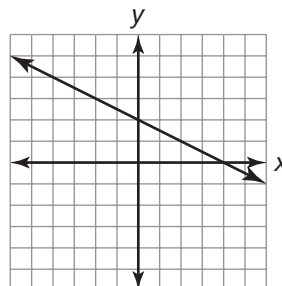
Graph A



Graph B



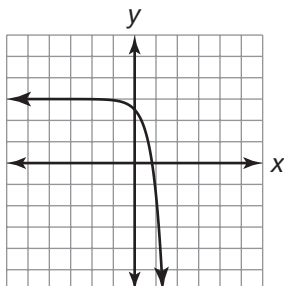
Graph C



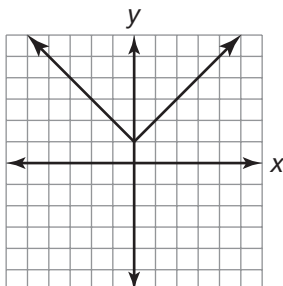
Graph A

8.  $f(x) = -x^2 + 4$

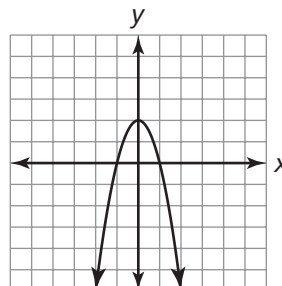
Graph A



Graph B

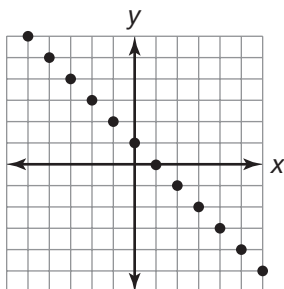


Graph C

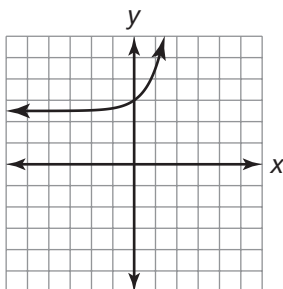


9.  $f(x) = 2^x + 5$

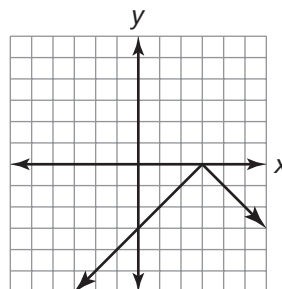
Graph A



Graph B

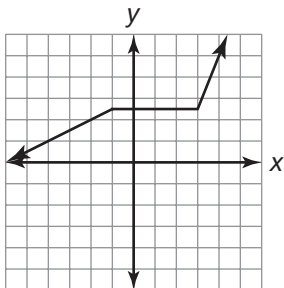


Graph C

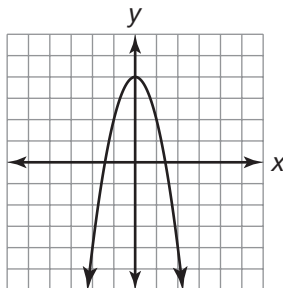


10.  $f(x) = |x - 6|$

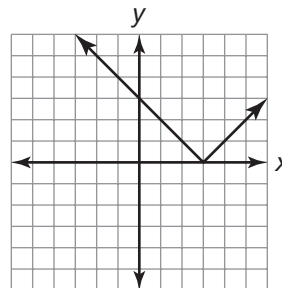
Graph A



Graph B

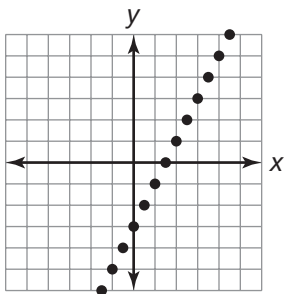


Graph C

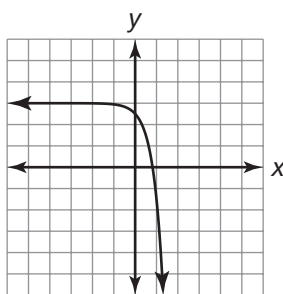


11.  $f(x) = 2x - 6$ , where  $x$  is an integer

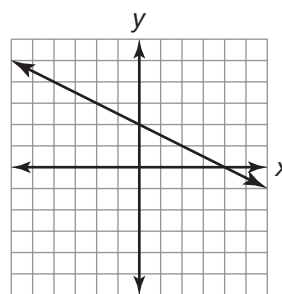
Graph A



Graph B

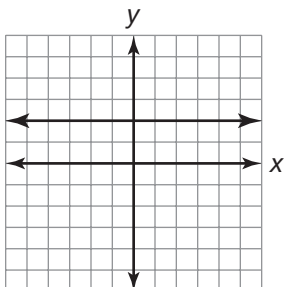


Graph C

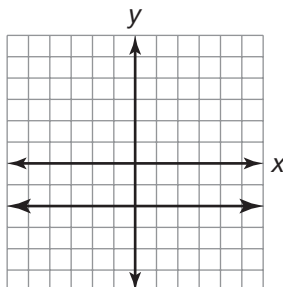


12.  $f(x) = -4$

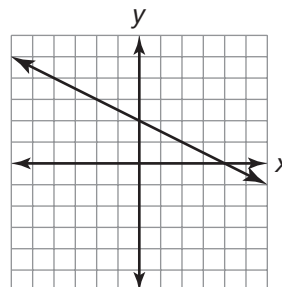
Graph A



Graph B



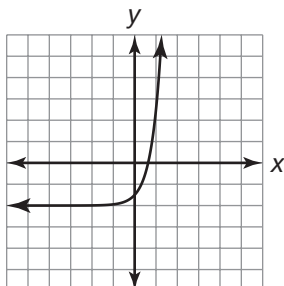
Graph C



Name \_\_\_\_\_ Date \_\_\_\_\_

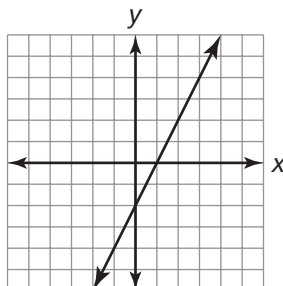
Determine whether each graph represents an increasing function, a decreasing function, a constant function, or a combination of increasing and decreasing functions.

13.

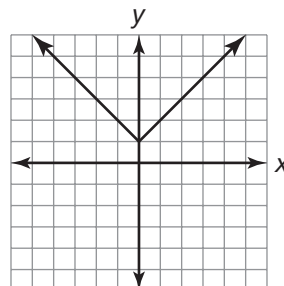


The graph represents an increasing function.

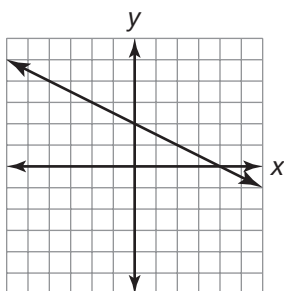
14.



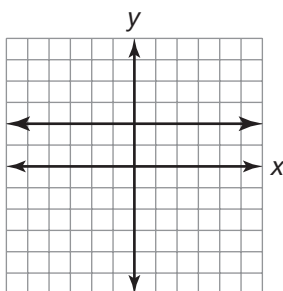
15.



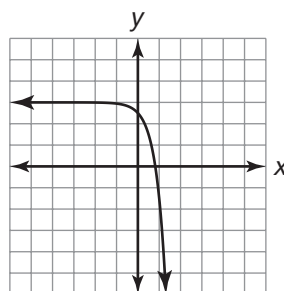
16.



17.

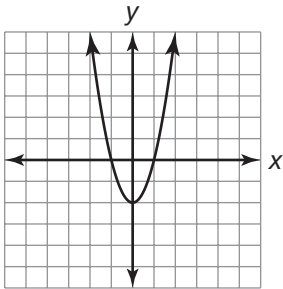


18.



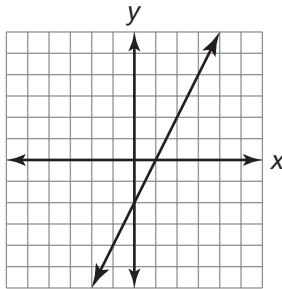
Determine whether each graph represents a function with an absolute minimum, an absolute maximum, or neither.

19.

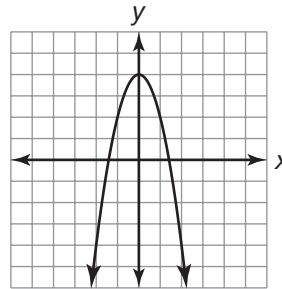


The graph represents a function with an absolute minimum.

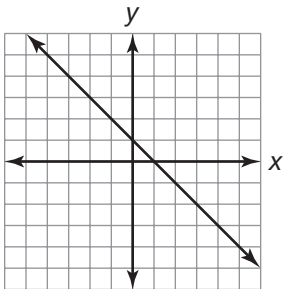
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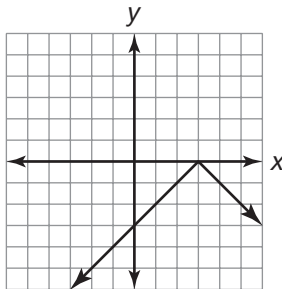
21.



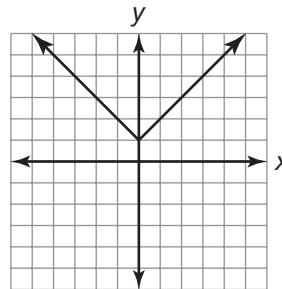
22.



23.



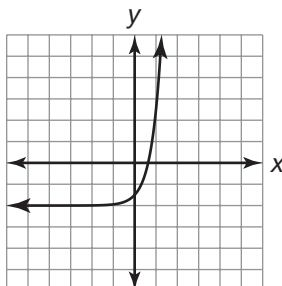
24.



Name \_\_\_\_\_ Date \_\_\_\_\_

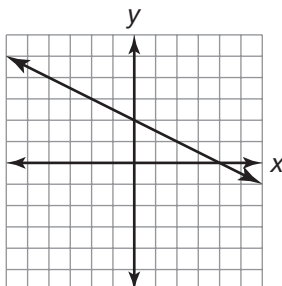
Determine whether each graph represents a linear function, a quadratic function, an exponential function, a linear absolute value function, a linear piecewise function, or a constant function.

25.

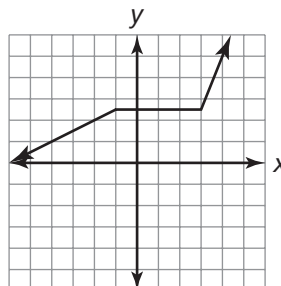


The graph represents an exponential function.

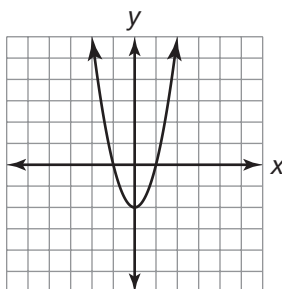
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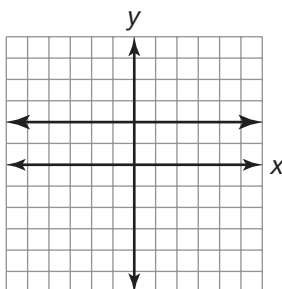
27.



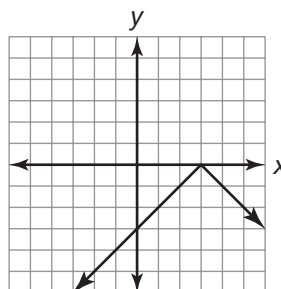
28.



29.



30.







Name \_\_\_\_\_ Date \_\_\_\_\_

## Function Families for 200, Alex...

### Recognizing Functions by Characteristics

#### Problem Set

Choose the appropriate function family or families to complete each sentence based on the given characteristic(s).

linear functions	quadratic functions
exponential functions	linear absolute value functions

1. The graph of this function family is a straight line. The function family is linear functions.
2. The graph of this function family has an increasing interval and a decreasing interval. The function family is \_\_\_\_\_.
3. The graph of this function family has an absolute minimum. The function family is \_\_\_\_\_.
4. The graph of this function family is decreasing over the entire domain. The function family is \_\_\_\_\_.
5. The graph of this function family forms a V shape. The function family is \_\_\_\_\_.
6. The graph of this function family has an increasing interval and a decreasing interval and forms a U shape. The function family is \_\_\_\_\_.
7. The graph of this function family does not have an absolute maximum or absolute minimum and is a smooth curve. The function family is \_\_\_\_\_.
8. The graph of this function family has an absolute maximum or absolute minimum and is made up of straight lines. The function family is \_\_\_\_\_.
9. The graph of this function family is made up of straight lines and does not have an absolute maximum or absolute minimum. The function family is \_\_\_\_\_.
10. The graph of this function family decreases over the entire domain and is a smooth curve. The function family is \_\_\_\_\_.

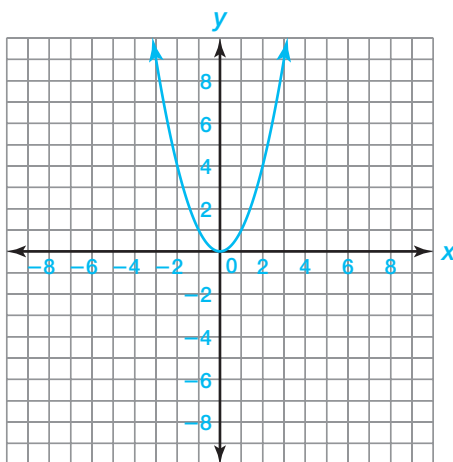
Create an equation and sketch a graph for a function with each set of given characteristics. Use values that are any real numbers between  $-10$  and  $10$ .

11. Create an equation and sketch a graph that:

- is a smooth curve,
- is continuous,
- has a minimum, and
- is quadratic.

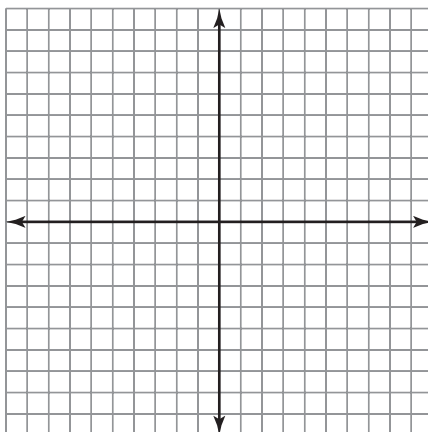
Answers will vary.

$$f(x) = x^2$$



12. Create an equation and sketch a graph that:

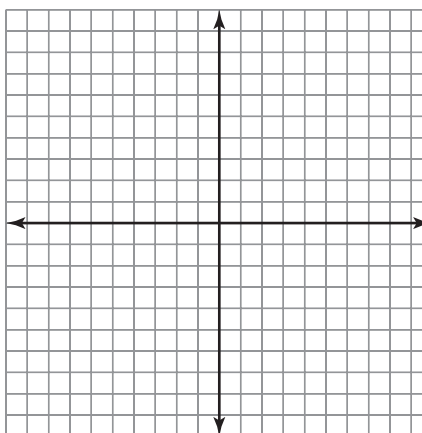
- is linear,
- is discrete, and
- is decreasing across the entire domain.



Name \_\_\_\_\_ Date \_\_\_\_\_

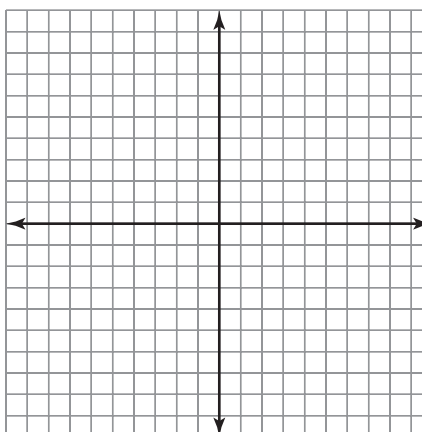
**13.** Create an equation and sketch a graph that:

- is a smooth curve,
- is increasing across the entire domain,
- is continuous, and
- is exponential.



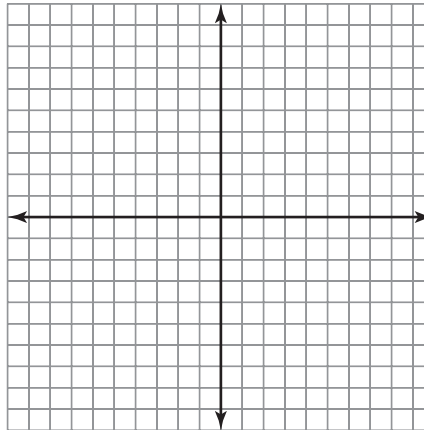
**14.** Create an equation and sketch a graph that:

- has a maximum,
- is continuous, and
- is a linear absolute value function.



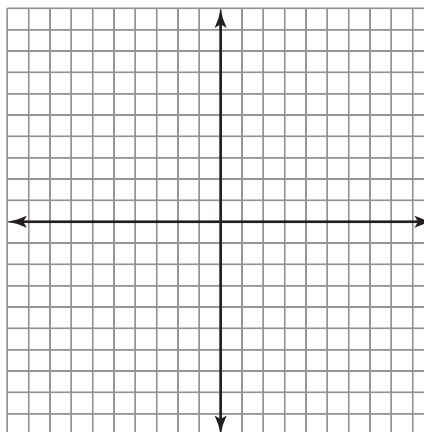
15. Create an equation and sketch a graph that:

- is linear,
- is continuous,
- is neither increasing nor decreasing across the entire domain, and
- does not pass through the origin.



16. Create an equation and sketch a graph that:

- is discrete,
- has a maximum,
- does not pass through the origin, and
- is quadratic.

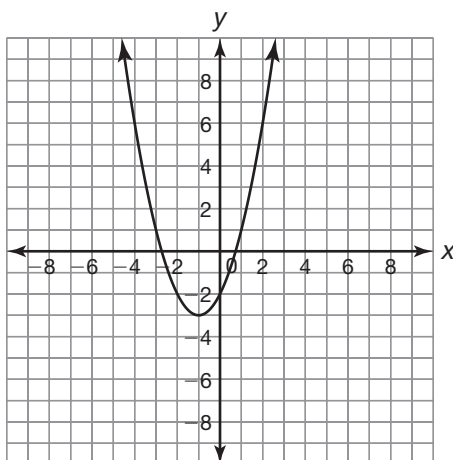


Name \_\_\_\_\_ Date \_\_\_\_\_

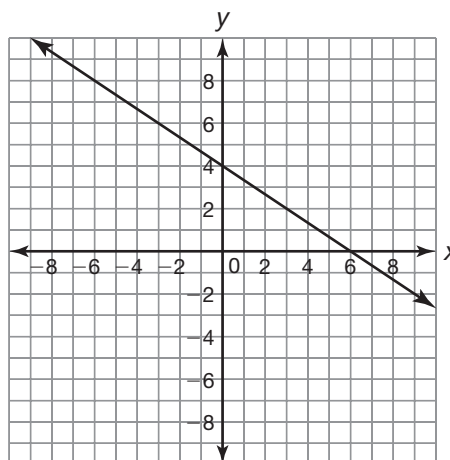
Choose the function family represented by each graph.

linear function	quadratic function	exponential function
linear absolute value function	linear piecewise function	

17.

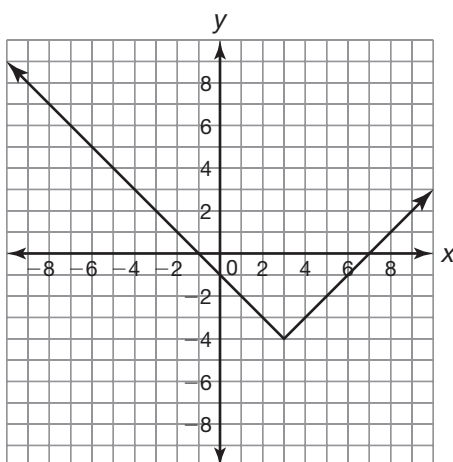


18.

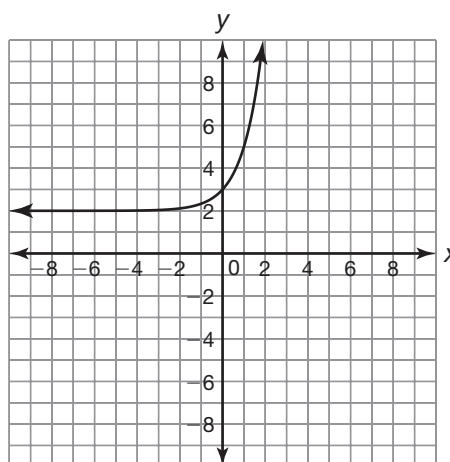


The graph represents a quadratic function.

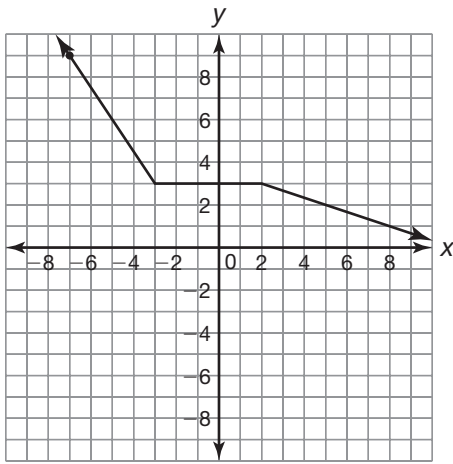
19.



20.



21.



22.

