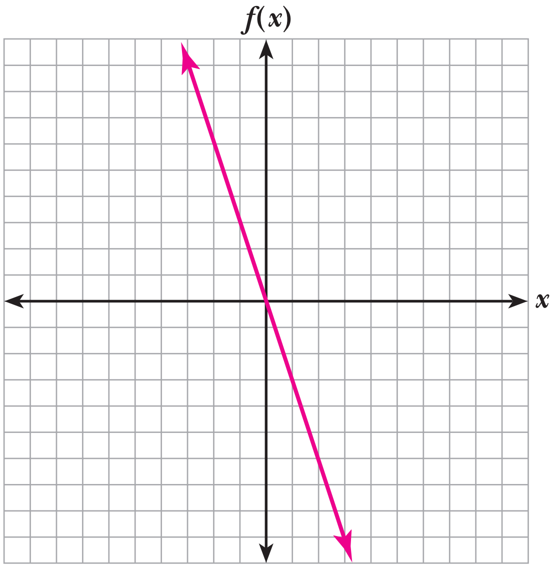
NAME ______________________

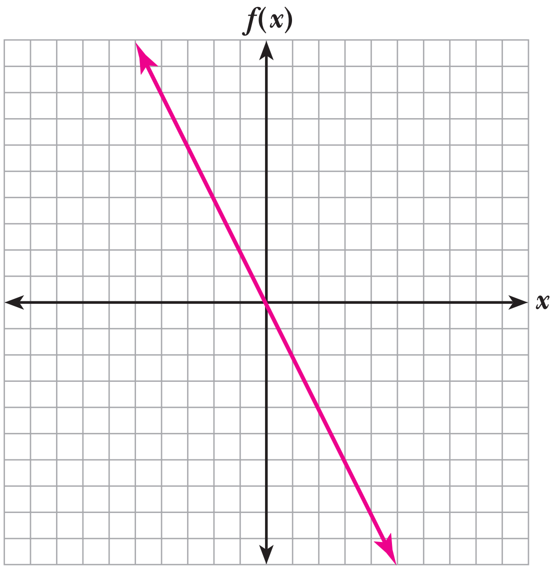
Module 9 Using Functions
Lesson 4 Graphing Functions

Graph each linear function.

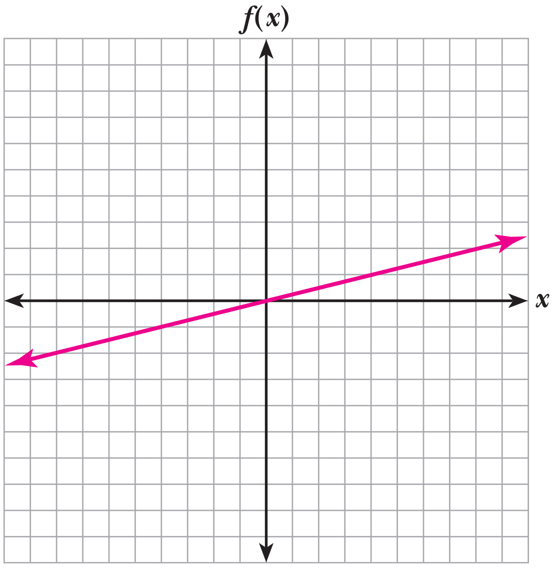
1. $f(x) = -3x$



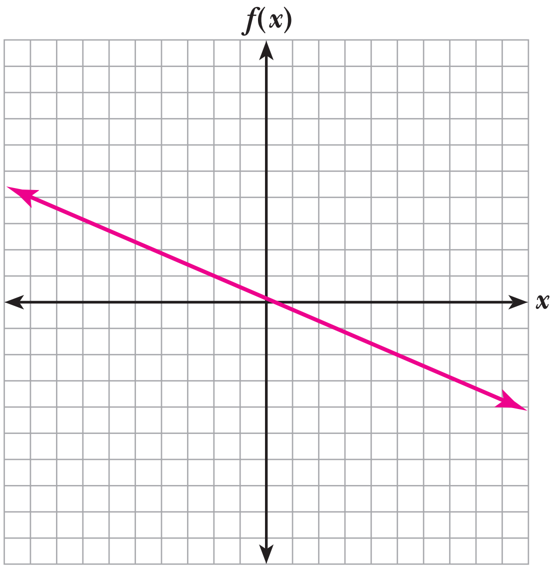
2. $f(x) = -2x$



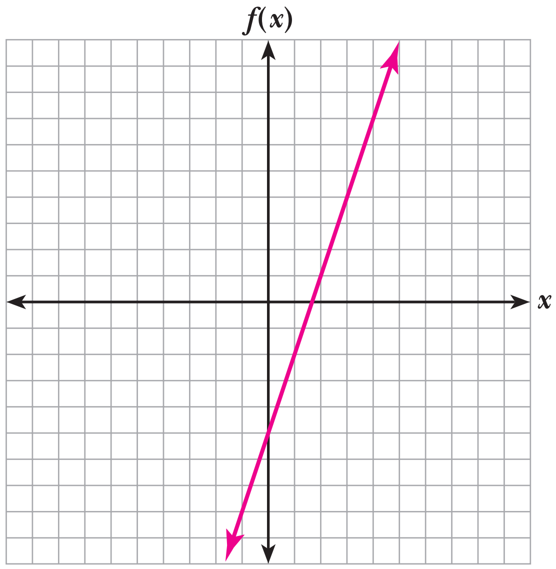
3. $f(x) = \frac{1}{4}x$



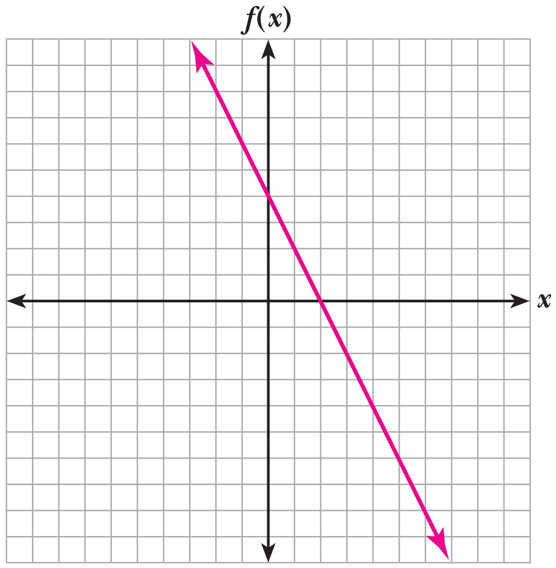
4. $f(x) = -\frac{2}{5}x$



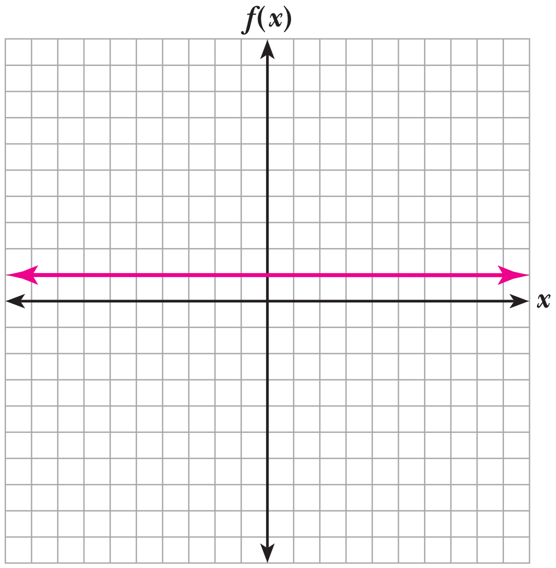
5. $f(x) = 3x - 5$



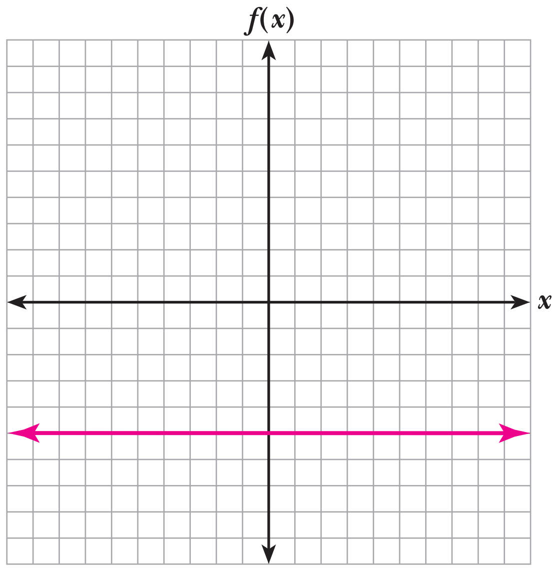
6. $f(x) = -2x + 4$



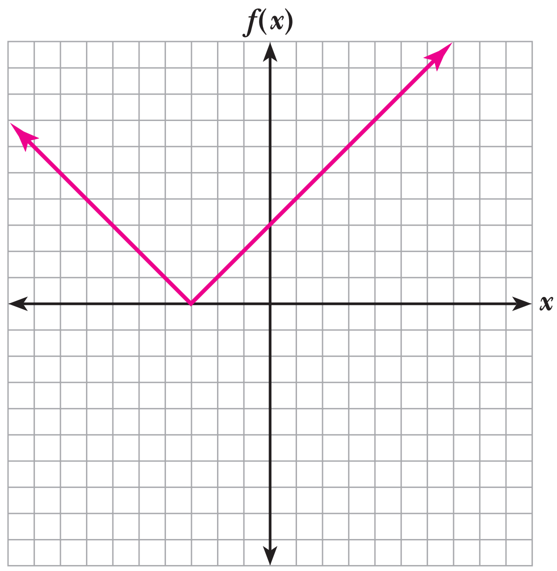
7. $f(x) = 1$



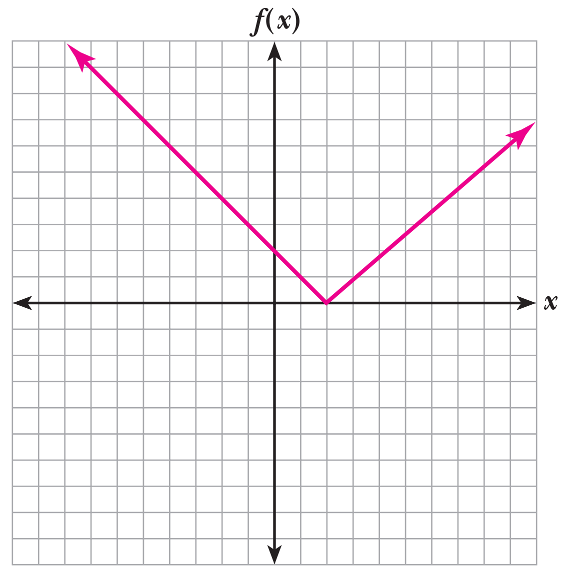
8. $f(x) = -5$



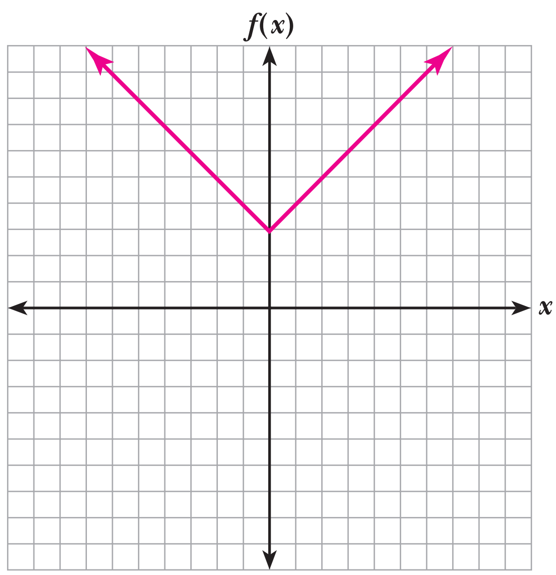
9. $f(x) = |x + 3|$



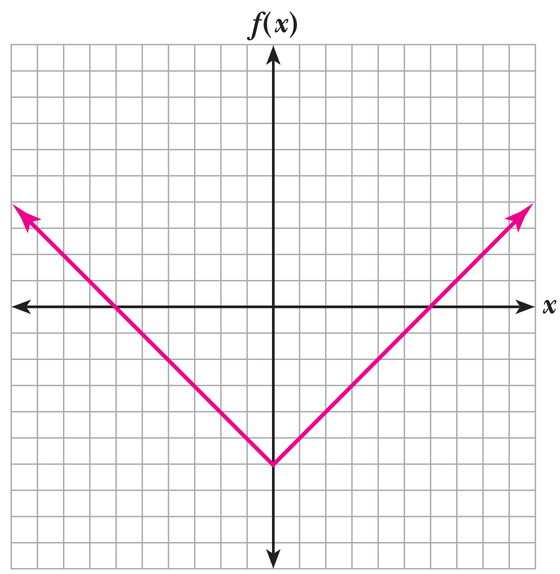
10. $f(x) = |x - 2|$



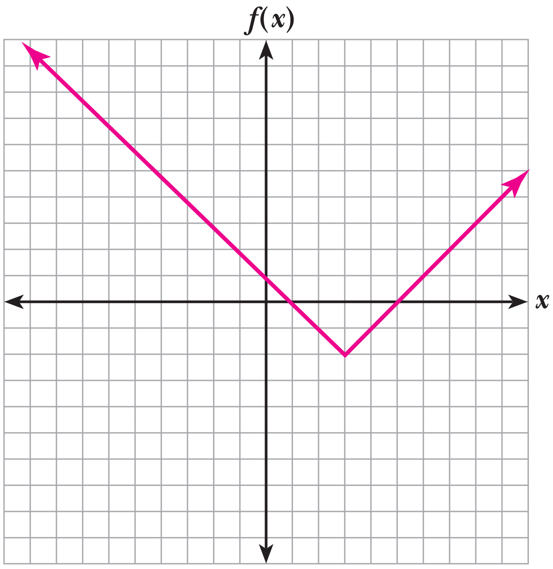
11. $f(x) = |x| + 3$



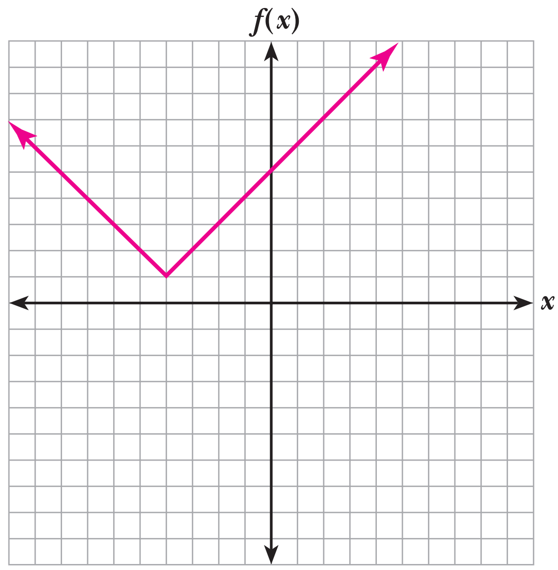
12. $f(x) = |x| - 6$



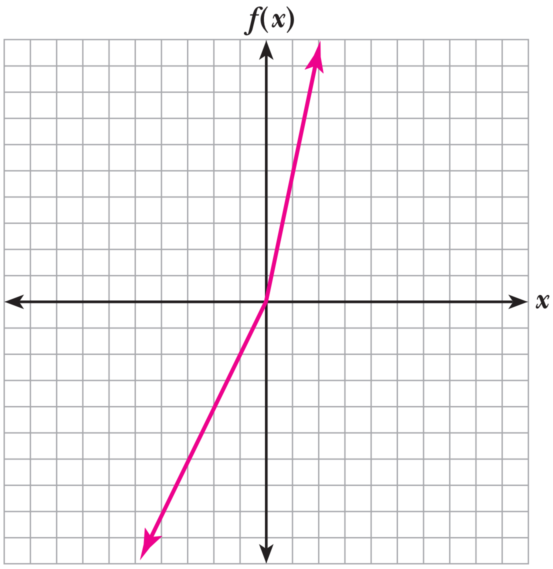
13. $f(x) = |x - 3| - 2$



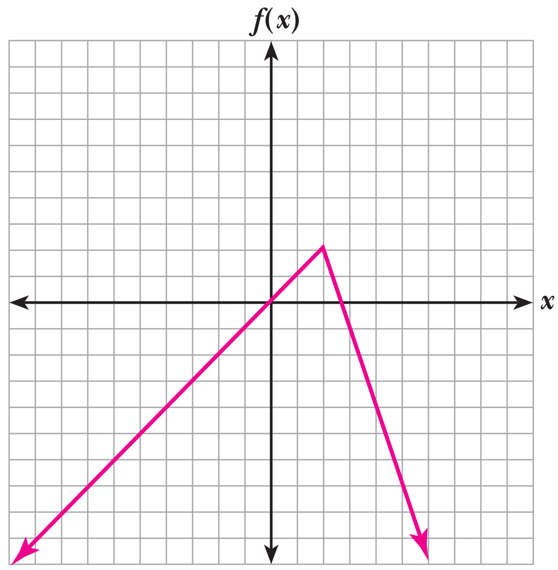
14. $f(x) = |x + 4| + 1$



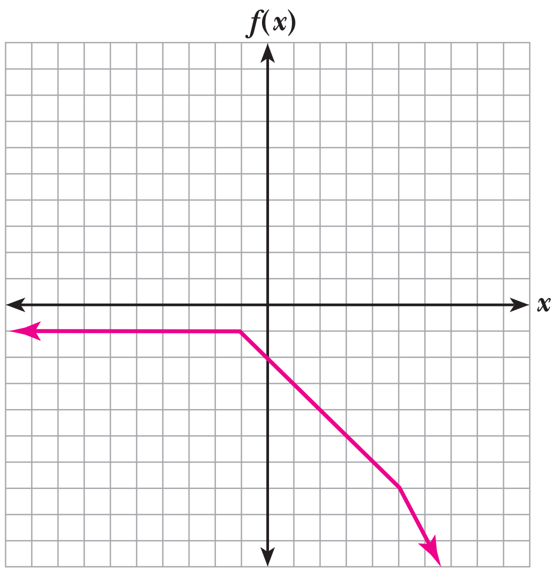
15. $f(x) = \begin{cases} 2x, & x < 0 \\ 4x, & x \geq 0 \end{cases}$



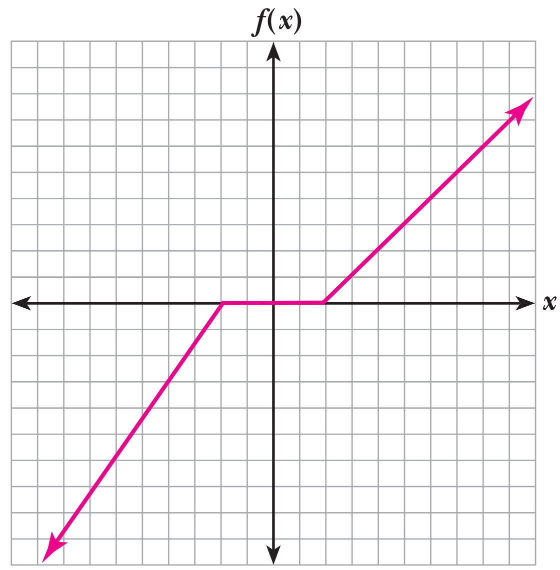
16. $f(x) = \begin{cases} x, & x \leq 2 \\ 8 - 3x, & x > 2 \end{cases}$



17. $f(x) = \begin{cases} -1, & x \le -1 \\ -x - 2, & -1 < x < 5 \\ -2x + 3, & x \ge 5 \end{cases}$



18. $f(x) = \begin{cases} \frac{3}{2}x + 3, & x \le -2 \\ 0, & -2 < x < 2 \\ x - 2, & x \ge 2 \end{cases}$



Journal

1. What is the equation of a graph formed by translating the parent graph of the function $f(x) = |x|$ up a units and to the right b units? Explain.
2. Explain how to use the graph of $f(x)$ to find $f(a)$, if a is a constant.
3. Graph the piecewise function $f(x) = \begin{cases} -3x, & x < 2 \\ x - 8, & x \ge 2 \end{cases}$. What is the domain of the function? What is the range? How does the equation show the domain and range? How does the graph show the domain and range?
4. Graph the functions $f(x) = |x|$ and $g(x) = 2|x|$. Compare and contrast the graphs. Predict what the graph of $h(x) = 4|x|$ would look like.
5. Define a piecewise function in your own words. Describe the notation used to write the equation of a piecewise function.

Possible Journal Responses

1. **$f(x) = |x - b| + a$. Subtracting b from the input variable moves the graph b units to the right. Adding a to the function moves the graph a units up.**
2. **To find $f(a)$, find the point on the graph for which the first element is a. Go to a on the x-axis, then look directly up or down to locate the point $(a, f(a))$.**

Cumulative Review

Use the ordered pairs to write a linear function. Then, use the function to find the given value.

1. (0, 10) and (3, 25); $f(5)$

$f(x) = 5x + 10$; $f(5) = 35$

2. (0, 200) and (7, 1600); $f(4)$

$f(x) = 200x + 200$; $f(4) = 1000$

3. (0, 112) and (9, 148); $f(20)$

$f(x) = 4x + 112$; $f(20) = 192$

4. (0, 62.5) and (5, 37.5); $f(10)$

$f(x) = -5x + 62.5$; $f(10) = 12.5$

5. (40, –360) and (70, –120); $f(0)$

$f(x) = 8x - 680$; $f(0) = -680$

6. (120, –400) and (180, –500); $f(270)$

$f(x) = -\frac{5}{3}x - 200$; $f(240) = -650$

Solve.

7. $|x + 2| = -5$

no solution

8. $|x - 5| = 3$

$x = 8$; $x = 2$

9. $2|x - 6| = 14$

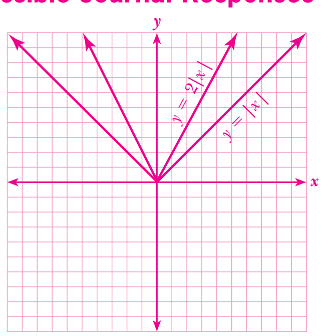
$x = 13$; $x = -1$

10. $|x + 10| \geq 8$

$x \geq -2$ or $x \leq -18$

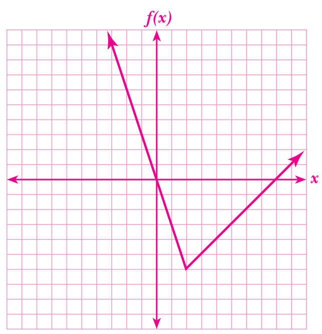
Possible Journal Responses *(continued)*

3.



The domain is $\Re$. The range is $y \geq -6$. Together, the inequalities $x < 2$ and $x \geq 2$ cover the complete range of real numbers, making the domain $\Re$. For each piece of the function, the minimum output is –6, making the range of the function $y \geq 6$. On the graph, the arrows at the end of each ray indicate that the rays go on forever, meaning that every x–value is in the domain of the function. Since the rays have endpoints at $y = -6$, –6 is the minimum value of y, making the domain $y \geq 6$.

4.



Both graphs are V-shaped. The graph of $g(x)$ is "skinnier" that the graph of $f(x)$, since for any given input, the output is twice as great, making the location of the ordered pair $(x, g(x))$ higher than the point $(x, f(x))$. The graph of $h(x)$ would be even sharper.

5. A piecewise function is comprised of two or more rules applying to only certain input values. Each range of input values has its own rule. The notation for piecewise functions shows a set of expressions, each followed by the part of the domain to which that rule is to be applied.