Graph each function. Identify the domain and range.

1. \( g(x) = \begin{cases} 
-3 & \text{if } x \leq -4 \\
-x & \text{if } -4 < x < 2 \\
x + 6 & \text{if } x \geq 2 
\end{cases} \)

**SOLUTION:**

The function is defined for all real values of \( x \), so the domain is all real numbers.

\( D = \{ \text{all real numbers} \} \)

The \( y \)-coordinates of points on the graph are real numbers less than or equal to 4, so the range is \( R = \{ y \mid y \leq 4 \} \).

2. \( f(x) = \begin{cases} 
8 & \text{if } x \leq -1 \\
2x & \text{if } -1 < x < 4 \\
-4 - x & \text{if } x \geq 4 
\end{cases} \)

**SOLUTION:**

The function is defined for all real values of \( x \), so the domain is all real numbers.

\( D = \{ \text{all real numbers} \} \)

The \( y \)-coordinates of points on the graph are real numbers between 8 and -2 and less than or equal to -8, so the range is \( R = \{ y \mid 8 \geq y > -2 \text{ or } y \leq -8 \} \).
Write the piecewise-defined function shown in each graph.

3.

**SOLUTION:**
The left portion of the graph is the line \( g(x) = x + 4 \). There is an open circle at \((-2, 2)\), so the domain for this part of the function is \( \{x \mid x < -2\} \).

The center portion of the graph is the constant function \( g(x) = -3 \). There are closed dots at \((-2, -3)\) and \((3, 3)\), so the domain for this part is \( \{x \mid -2 \leq x \leq 3\} \).

The right portion of the graph is the line \( g(x) = -2x + 12 \). There is an open circle at \((3, 6)\), so the domain for this part is \( \{x \mid x > 3\} \).

Write the piecewise function.

\[
g(x) = \begin{cases} 
  x + 4 & \text{if } x < -2 \\
  -3 & \text{if } -2 \leq x \leq 3 \\
  -2x + 12 & \text{if } x > 3 
\end{cases}
\]
5. **CCSS REASONING** Springfield High School’s theater can hold 250 students. The drama club is performing a play in the theater. Draw a graph of a step function that shows the relationship between the number of tickets sold \( x \) and the minimum number of performances \( y \) that the drama club must do.

**SOLUTION:**
When \( x \) is greater than 0 and less than or equal to 250, the drama club needs to do only one performance. When \( x \) is greater than 250 and less than or equal to 500, they must do at least two performances. Continue the pattern with a table.

<table>
<thead>
<tr>
<th>( x )</th>
<th>( y )</th>
</tr>
</thead>
<tbody>
<tr>
<td>( 0 &lt; x \leq 250 )</td>
<td>1</td>
</tr>
<tr>
<td>( 250 &lt; x \leq 500 )</td>
<td>2</td>
</tr>
<tr>
<td>( 500 &lt; x \leq 750 )</td>
<td>3</td>
</tr>
<tr>
<td>( 750 &lt; x \leq 1000 )</td>
<td>4</td>
</tr>
<tr>
<td>( 1000 &lt; x \leq 1250 )</td>
<td>5</td>
</tr>
</tbody>
</table>

Graph each function. Identify the domain and range.

6. \( g(x) = -2 \lceil x \rceil \)

**SOLUTION:**

\[ g(x) = \begin{cases} 
-8, & \text{if } x = -4 \\
-6, & \text{if } x = -5 \\
-4, & \text{if } x = -6 \\
-2, & \text{if } x = -7 \\
\end{cases} \]

D = \{all real numbers\}

The function \( g(x) \) is a reflection of twice of a greatest integer function. So, \( g(x) \) takes all even integer values or zero.

R = \{all even integers\}

7. \( h(x) = \lfloor x - 5 \rfloor \)

**SOLUTION:**

\[ h(x) = \begin{cases} 
-8, & \text{if } x = -2 \\
-6, & \text{if } x = -3 \\
-4, & \text{if } x = -4 \\
-2, & \text{if } x = -5 \\
\end{cases} \]

D = \{all real numbers\}

R = \{all integers\}
Graph each function. Identify the domain and range.

8. \( g(x) = |−3x| \)

**SOLUTION:**

\[
\text{D} = \{ \text{all real numbers} \} \\
\text{R} = \{ g(x) | g(x) \geq 0 \} 
\]

9. \( f(x) = 2|x| \)

**SOLUTION:**

\[
\text{D} = \{ \text{all real numbers} \} \\
\text{R} = \{ f(x) | f(x) \geq 0 \} 
\]

10. \( h(x) = |x + 4| \)

**SOLUTION:**

\[
\text{D} = \{ \text{all real numbers} \} \\
\text{R} = \{ h(x) | h(x) \geq 0 \} 
\]

11. \( s(x) = |−2x| + 6 \)

**SOLUTION:**

\[
\text{D} = \{ \text{all real numbers} \} \\
\text{R} = \{ s(x) | s(x) \geq 6 \} 
\]
Graph each function. Identify the domain and range.

12. \( f(x) = \begin{cases} 
-3x & \text{if } x \leq -4 \\
8 & \text{if } x > 3 \\
x & \text{if } 0 < x \leq 3 
\end{cases} \)

**SOLUTION:**

\[ D = \{ x \mid x \leq -4 \text{ or } x > 0 \} \]

\[ R = \{ f(x) \mid f(x) \geq 12, f(x) = 8 \text{ or } 0 < f(x) \leq 3 \} \]

13. \( f(x) = \begin{cases} 
2x & \text{if } x \leq -6 \\
5 & \text{if } -6 < x \leq 2 \\
-2x + 1 & \text{if } x > 4 
\end{cases} \)

**SOLUTION:**

\[ D = \{ x \mid x \leq 2 \text{ or } x > 4 \} \]

\[ R = \{ f(x) \mid f(x) < -7 \text{ or } f(x) = 5 \} \]

14. \( g(x) = \begin{cases} 
2x + 2 & \text{if } x < -6 \\
x & \text{if } -6 \leq x \leq 2 \\
-3 & \text{if } x > 2 
\end{cases} \)

**SOLUTION:**

\[ D = \{ \text{all real numbers} \} \]

\[ R = \{ g(x) \mid g(x) < -10 \text{ or } -6 \leq g(x) \leq 2 \} \]

15. \( g(x) = \begin{cases} 
-2 & \text{if } x < -4 \\
x - 3 & \text{if } -1 \leq x \leq 5 \\
2x - 15 & \text{if } x > 7 
\end{cases} \)

**SOLUTION:**

\[ D = \{ x \mid x < -4, -1 \leq x \leq 5, \text{ or } x > 7 \} \]

\[ R = \{ g(x) \mid g(x) \geq -4 \} \]
Write the piecewise-defined function shown in each graph.

![Graph](image)

### SOLUTION:
The left portion of the graph is the constant function \( g(x) = -8 \). There is a closed dot at \((-6, -8)\), so the domain for this part of the function is \( \{x \mid x \leq -6\} \).

The center portion of the graph is the line \( g(x) = 0.25x + 2 \). There are closed dots at \((-4, 1)\) and \((4, 3)\), so the domain for this part is \( \{x \mid -4 \leq x \leq 4\} \).

The right portion of the graph is the constant function \( g(x) = 4 \). There is an open circle at \((6, 4)\), so the constant function is defined for \( \{x \mid x > 6\} \).

Write the piecewise function.

\[
g(x) = \begin{cases} 
-8 & \text{if } x \leq -6 \\
0.25x + 2 & \text{if } -4 \leq x \leq 4 \\
4 & \text{if } x > 6 
\end{cases}
\]
2-6 Special Functions

**SOLUTION:**
The left portion of the graph is the constant function \( g(x) = -9 \). There is an open circle at \((-5, -9)\), so the domain for this part of the function is \( \{x | x < -5\} \).

The center portion of the graph is the line \( g(x) = x + 4 \). There are closed dots at \((0, 4)\) and \((3, 7)\), so the domain for this part is \( \{x | 0 \leq x \leq 3\} \).

The right portion of the graph is the line \( g(x) = x - 3 \). There is an open circle at \((7, 4)\), so the domain for this part is \( \{x | x > 7\} \).

Write the piecewise function.

\[
g(x) = \begin{cases} 
-9 & \text{if } x < -5 \\
 x + 4 & \text{if } 0 \leq x \leq 3 \\
 x - 3 & \text{if } x > 7 
\end{cases}
\]

**SOLUTION:**
The left portion of the graph is the constant function \( g(x) = 8 \). There is a closed dot at \((-1, 8)\), so the domain for this part is \( \{x | x < -1\} \).

The center portion of the graph is the line \( g(x) = 2x \). There are closed dots at \((4, 8)\) and \((6, 12)\), so the domain for this part is \( \{x | 4 \leq x \leq 6\} \).

The right portion of the graph is the line \( g(x) = 2x - 15 \). There is a circle at \((7, -1)\), so the domain for this part is \( \{x | x > 7\} \).

Write the piecewise function.

\[
g(x) = \begin{cases} 
8 & \text{if } x \leq -1 \\
 2x & \text{if } 4 \leq x \leq 6 \\
 2x - 15 & \text{if } x > 7 
\end{cases}
\]
2-6 Special Functions

Graph each function. Identify the domain and range.

20. \( f(x) = \left\lfloor x \right\rfloor - 6 \)

**SOLUTION:**

![Graph of \( f(x) = \left\lfloor x \right\rfloor - 6 \)](graph1.png)

D = \{all real numbers\}

R = \{all integers\}

21. \( h(x) = \left\lfloor 3x \right\rfloor - 8 \)

**SOLUTION:**

![Graph of \( h(x) = \left\lfloor 3x \right\rfloor - 8 \)](graph2.png)

D = \{all real numbers\}

R = \{all integers\}

22. \( f(x) = \left\lfloor 3x + 2 \right\rfloor \)

**SOLUTION:**

![Graph of \( f(x) = \left\lfloor 3x + 2 \right\rfloor \)](graph3.png)

D = \{all real numbers\}

R = \{all integers\}

23. \( g(x) = 2 \left\lfloor 0.5x + 4 \right\rfloor \)

**SOLUTION:**

![Graph of \( g(x) = 2 \left\lfloor 0.5x + 4 \right\rfloor \)](graph4.png)

The function is defined for all real values of \( x \), so the domain is all real numbers.

D = \{all real numbers\}

The function \( g(x) \) is twice of a greatest integer function. So, \( g(x) \) takes only even integer values. Therefore, the range is \( R = \{all \ even \ integers\} \).
Graph each function. Identify the domain and range.

24. \( f(x) = |x - 5| \)

**SOLUTION:**

\[
\begin{array}{c}
\text{D = \{all real numbers\}} \\
\text{R = \{f(x) \mid f(x) \geq 0\}} \\
\end{array}
\]

25. \( g(x) = |x + 2| \)

**SOLUTION:**

\[
\begin{array}{c}
\text{D = \{all real numbers\}} \\
\text{R = \{g(x) \mid g(x) \geq 0\}} \\
\end{array}
\]

26. \( h(x) = |2x| - 8 \)

**SOLUTION:**

\[
\begin{array}{c}
\text{D = \{all real numbers\}} \\
\text{R = \{h(x) \mid h(x) \geq -8\}} \\
\end{array}
\]

27. \( k(x) = |-3x| + 3 \)

**SOLUTION:**

\[
\begin{array}{c}
\text{D = \{all real numbers\}} \\
\text{R = \{k(x) \mid k(x) \geq 3\}} \\
\end{array}
\]
2-6 Special Functions

28.  \( f(x) = 2|x - 4| + 6 \)

**SOLUTION:**

\[
\begin{array}{c}
\text{Graph} \\
\text{D = \{all real numbers\}} \\
\text{R = \{f(x) \mid f(x) \geq 6\}} \\
\end{array}
\]

29.  \( h(x) = -3|0.5x + 1| - 2 \)

**SOLUTION:**

\[
\begin{array}{c}
\text{Graph} \\
\text{D = \{all real numbers\}} \\
\text{R = \{h(x) \mid h(x) \leq -2\}} \\
\end{array}
\]

30. **GIVING** Patrick is donating money and volunteering his time to an organization that restores homes for the needy. His employer will match his monetary donations up to $100

   a. Identify the type of function that models the total money received by the charity when Patrick donates \( x \) dollars.

   b. Write and graph a function for the situation.

**SOLUTION:**

a. The function is composed of two distinct linear functions. Therefore, it is a piecewise function.

b. \( f(x) = \begin{cases} 
2x & \text{if } 0 < x \leq 100 \\
100 & \text{if } x \geq 100 
\end{cases} \)
2-6 Special Functions

31. CCSS SENSE-MAKING A car’s speedometer reads 60 miles an hour.

   a. Write an absolute value function for the difference between the car’s actual speed \( a \) and the reading on the speedometer.

   b. What is an appropriate domain for the function? Explain your reasoning.

   c. Use the domain to graph the function.

**SOLUTION:**

   a. The absolute value function is \( f(a) = |a - 60| \).

   b. Since the speed of the car cannot be negative, the appropriate domain for the function is \( \{a \mid a \geq 0\} \).

   c.

   ![Graph](image)

32. RECREATION The charge for renting a bicycle from a rental shop for different amounts of time is shown at the right.

   a. Identify the type of function that models this situation.

   b. Write and graph a function for the situation.

**SOLUTION:**

   a. The rent is constant in each interval. Therefore, the situation is best modeled by a step function.

   b.

   \[
   c(t) = \begin{cases} 
   6 & \text{if } t \leq \frac{1}{2} \\
   10 & \text{if } \frac{1}{2} < t \leq 1 \\
   16 & \text{if } 1 < t \leq 2 \\
   24 & \text{if } 2 < t \leq 24 
   \end{cases}
   \]

   ![Graph](image)
Graph each function. Identify the domain and range.

35. \( f(x) = \lfloor 0.5x \rfloor \)

**SOLUTION:**

\[ D = \{ \text{all real numbers} \}; \]
\[ R = \{ \text{all positive integers} \}; \]

36. \( g(x) = \lceil 2x \rceil \)

**SOLUTION:**

\[ D = \{ \text{all real numbers} \}; \]
\[ R = \{ \text{all non-negative integers} \}; \]
2-6 Special Functions

37. \( g(x) = \begin{cases} 
\lfloor x \rfloor & \text{if } x < -4 \\
x + 1 & \text{if } -4 \leq x \leq 3 \\
-x & \text{if } x > 3 
\end{cases} \)

**SOLUTION:**

\[
\begin{array}{c|ccc|}
 & -6 & -4 & -2 \\
\hline
0 & 3 & 0 & 1 \\
\hline
\end{array}
\]

\( D = \{ \text{all real numbers} \} \)

\( R = \{ g(x) \mid g(x) \leq 4 \} \).

38. \( h(x) = \begin{cases} 
-x & \text{if } x < -6 \\
x & \text{if } -6 \leq x \leq 2 \\
-x & \text{if } x > 2 
\end{cases} \)

**SOLUTION:**

\[
\begin{array}{c|ccc|}
 & -6 & -4 & -2 \\
\hline
0 & -1 & -1 & 1 \\
\hline
\end{array}
\]

\( D = \{ \text{all real numbers} \} \)

\( R = \{ h(x) \mid h(x) \leq -6 \text{ or } 0 \leq h(x) \} \).

39. **MULTIPLE REPRESENTATIONS** Consider the following absolute value functions.

\[ f(x) = |x| - 4 \quad g(x) = |3x| \]

a. **TABULAR** Use a graphing calculator to create a table of \( f(x) \) and \( g(x) \) values for \( x = -4 \) to \( x = 4 \).

<table>
<thead>
<tr>
<th>( x )</th>
<th>( f(x) )</th>
<th>( g(x) )</th>
</tr>
</thead>
<tbody>
<tr>
<td>-4</td>
<td>2</td>
<td>2</td>
</tr>
<tr>
<td>-3</td>
<td>1</td>
<td>1</td>
</tr>
<tr>
<td>-2</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>-1</td>
<td>-1</td>
<td>-1</td>
</tr>
<tr>
<td>0</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>1</td>
<td>-1</td>
<td>-1</td>
</tr>
<tr>
<td>2</td>
<td>-2</td>
<td>-2</td>
</tr>
<tr>
<td>3</td>
<td>-3</td>
<td>-3</td>
</tr>
<tr>
<td>4</td>
<td>-4</td>
<td>-4</td>
</tr>
</tbody>
</table>

b. **GRAPHICAL** Graph the functions on separate graphs.

c. **NUMERICAL** Determine the slope between each two consecutive points in the table.

<table>
<thead>
<tr>
<th>( x )</th>
<th>( f(x) )</th>
<th>( g(x) )</th>
</tr>
</thead>
<tbody>
<tr>
<td>-4</td>
<td>2</td>
<td>2</td>
</tr>
<tr>
<td>-3</td>
<td>1</td>
<td>1</td>
</tr>
<tr>
<td>-2</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>-1</td>
<td>-1</td>
<td>-1</td>
</tr>
<tr>
<td>0</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>1</td>
<td>-1</td>
<td>-1</td>
</tr>
<tr>
<td>2</td>
<td>-2</td>
<td>-2</td>
</tr>
<tr>
<td>3</td>
<td>-3</td>
<td>-3</td>
</tr>
<tr>
<td>4</td>
<td>-4</td>
<td>-4</td>
</tr>
</tbody>
</table>

d. The two sections of an absolute value graph have opposite slopes. The slope is constant for each section of the graph.
2-6 Special Functions

40. OPEN ENDED Write an absolute value relation in which the domain is all nonnegative numbers and the range is all real numbers.

**SOLUTION:**
Sample answer: \(|y| = x\)

41. CHALLENGE Graph \(|y| = 2|x + 3| - 5\).

**SOLUTION:**

42. CCSS ARGUMENTS Find a counterexample to the following statement and explain your reasoning. In order to find the greatest integer function of \(x\) when \(x\) is not an integer, round \(x\) to the nearest integer.

**SOLUTION:**
Sample answer: 8.6
The greatest integer function asks for the greatest integer less than or equal to the given value; thus 8 is the greatest integer. If we were to round this value to the nearest integer, we would round up to 9.

43. OPEN ENDED Write an absolute value function in which \(f(5) = -3\).

**SOLUTION:**
Sample answer: \(f(x) = -|x - 2|\)

44. WRITING IN MATH Explain how piecewise functions can be used to accurately represent real-world problems.

**SOLUTION:**
Sample answer: Piecewise functions can be used to represent the cost of items when purchased in quantities, such as a dozen eggs.

45. SHORT RESPONSE What expression gives the \(n\)th term of the linear pattern defined by the table?

<table>
<thead>
<tr>
<th>(n)</th>
<th>2</th>
<th>4</th>
<th>6</th>
<th>8</th>
<th>10</th>
</tr>
</thead>
<tbody>
<tr>
<td>(y)</td>
<td>7</td>
<td>13</td>
<td>19</td>
<td>25</td>
<td>?</td>
</tr>
</tbody>
</table>

**SOLUTION:**
So, the \(n\)th term is \(3n + 1\).
2-6 Special Functions

46. Solve: \(5(x + 4) = x + 4\)

Step 1: \(5x + 20 = x + 4\)

Step 2: \(4x + 20 = 4\)

Step 3: \(4x = 24\)

Step 4: \(x = 6\)

Which is the first incorrect step in the solution shown above?

A Step 4  
B Step 3  
C Step 2  
D Step 1

**SOLUTION:**
Solve: \(5(x + 4) = x + 4\)
Step 1: \(5x + 20 = x + 4\)
Step 2: \(4x + 20 = 4\)
Step 3: \(4x = 16\)
Step 4: \(x = 4\)

Compare the steps. The first incorrect step in the solution is on step 3. Therefore, option B is the correct answer.

47. **NUMBER THEORY** Twelve consecutive integers are arranged in order from least to greatest. If the sum of the first six integers is 381, what is the sum of the last six integers?

F 345  
G 381  
H 387  
J 417

**SOLUTION:**
Let \(x\) be least number in the consecutive integer.

Sum of the first six integers = \(x + (x + 1) + (x + 2) + (x + 3) + (x + 4) + (x + 5)\)
= \(6x + 15\)

Equate \(6x + 15\) to 381 and solve for \(x\).

\[6x + 15 = 381\]
\[6x = 366\]
\[x = 61\]

Therefore, the last 6 integers are 67, 68, 69, 70, 71 and 72.

\[67 + 68 + 69 + 70 + 71 + 72 = 417\]

Therefore, option J is the correct answer.
48. **ACT/SAT** For which function does

\[
f\left(-\frac{1}{2}\right) \neq -1?
\]

A  \(f(x) = 2x\)

B  \(f(x) = |\text{-}2x|\)

C  \(f(x) = \lfloor x \rfloor\)

D  \(f(x) = \lceil 2x \rceil\)

E  \(f(x) = -|2x|\)

**SOLUTION:**

\[
f(x) = 2x
\]

\[
f\left(-\frac{1}{2}\right) = 2\left(-\frac{1}{2}\right) = -1
\]

\[
f(x) = |\text{-}2x|
\]

\[
f\left(-\frac{1}{2}\right) = |\text{-}2\left(-\frac{1}{2}\right)| = |1| = 1
\]

Therefore, option B is the correct answer.

49. **FOOTBALL** The table shows the relationship between the total number of male students per school and the number of students who tried out for the football team.

<table>
<thead>
<tr>
<th>Number of Male Students</th>
<th>Number of Tryouts</th>
</tr>
</thead>
<tbody>
<tr>
<td>180</td>
<td>46</td>
</tr>
<tr>
<td>212</td>
<td>51</td>
</tr>
<tr>
<td>274</td>
<td>62</td>
</tr>
<tr>
<td>401</td>
<td>75</td>
</tr>
<tr>
<td>513</td>
<td>81</td>
</tr>
<tr>
<td>589</td>
<td>90</td>
</tr>
</tbody>
</table>

**SOLUTION:**

a. Find a regression equation for the data.

b. Determine the correlation coefficient.

c. Predict how many students will try out for football at a school with 800 male students.

\[
y = 0.10x + 30.34
\]

b. \(r = 0.987\)

c. Substitute \(x = 800\) in the equation \(y = 0.10x + 30.34\).

\[
y = 0.10(800) + 30.34
\]

\[
= 80 + 30.34
\]

\[
\approx 110
\]

So, at a school with 800 male students, about 110 students will try out for football.
2-6 Special Functions

Write an equation in slope-intercept form for the line described.

50. passes through $(-3, -6)$, perpendicular to $y = -2x + 1$

SOLUTION:
The slope of the line $y = -2x + 1$ is $-2$.

Therefore, the slope of a line perpendicular to $y = -2x + 1$ is $m = \frac{1}{2} = 0.5$.

Substitute 0.5 for $m$ in the slope-intercept form.

$$y = 0.5x + b$$

Substitute $-3$ and $-6$ for $x$ and $y$ and solve for $b$.

$$-6 = 0.5(-3) + b$$

$$b = -6 + 1.5$$

$$b = -4.5$$

Therefore, the equation of the line which passes through the point $(-3, -6)$ and is perpendicular to $y = -2x + 1$ is $y = 0.5x - 4.5$.

51. passes through $(4, 0)$, parallel to $3x + 2y = 6$

SOLUTION:
The slope of the line $3x + 2y = 6$ is $m = \frac{3}{2}$.

Therefore, the slope of a line parallel to the line $3x + 2y = 6$ is $-\frac{3}{2}$.

Substitute $-\frac{3}{2}$ for $m$ in the slope-intercept form.

$$y = -\frac{3}{2}x + b$$

Substitute 4 and 0 for $x$ and $y$ and solve for $b$.

$$0 = -\frac{3}{2}(4) + b$$

$$b = \frac{3}{2}(4)$$

$$b = 6$$

Therefore, the equation of the line which passes through the point $(4, 0)$ and is parallel to $3x + 2y = 6$ is $y = -\frac{3}{2}x + 6$. 
52. passes through the origin, perpendicular to $4x - 3y = 12$

**SOLUTION:**

The slope of the line $4x - 3y = 12$ is $\frac{4}{3}$.

Therefore, the slope of a line perpendicular to the line $4x - 3y = 12$ is $-\frac{3}{4}$.

Substitute $-\frac{3}{4}$ for $m$ in the slope-intercept form.

$$y = -\frac{3}{4}x + b$$

Substitute 0 and 0 for $x$ and $y$ and solve for $b$.

$$0 = -\frac{3}{4}(0) + b$$

$$b = 0$$

Therefore, the equation of the line which passes through the origin and is perpendicular to $4x - 3y = 12$ is $y = -\frac{3}{4}x$.

Find each value if $f(x) = -4x + 6, g(x) = -x^2$, and $h(x) = -2x^2 - 6x + 9$.

53. $f(2c)$

**SOLUTION:**

Substitute $2c$ for $x$ in the function $f(x)$.

$$f(2c) = -4(2c) + 6$$

$$f(2c) = -8c + 6$$

54. $g(a + 1)$

**SOLUTION:**

Substitute $a + 1$ for $x$ in the function $g(x)$.

$$g(a + 1) = -(a + 1)^2$$

$$= -(a^2 + 2a + 1)$$

$$g(a + 1) = -a^2 - 2a - 1$$

55. $h(6)$

**SOLUTION:**

Substitute 6 for $x$ in the function $h(x)$.

$$h(6) = -2(6)^2 - 6(6) + 9$$

$$= -2(36) - 36 + 9$$

$$= -99$$

56. Determine whether the figures below are similar.

**SOLUTION:**

The ratio between the length of the rectangles is $\frac{33}{26.4} = 1.25$.

The ratio between the width of the rectangles is $\frac{12}{9.6} = 1.25$.

Since the ratios of the sides are equal, the given figures are similar.
Graph each equation.

57. \( y = -0.25x + 8 \)

**SOLUTION:**

58. \( y = \frac{4}{3}x + 2 \)

**SOLUTION:**

59. \( 8x + 4y = 32 \)

**SOLUTION:**