

4.1 Domain/Range & Interval Notation

Identify the domain of each function below:

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

5. $f(x) = \frac{5x+7}{x^2-9}$

9. $f(x) = \sqrt{5x+2}$

2. $f(x) = 5x^4 - 8$

6. $f(x) = \frac{2x}{x^2-3x-10}$

10. $f(x) = \frac{\sqrt{3-7x}}{5}$

3. $f(x) = \frac{3x-5}{x}$

7. $f(x) = \frac{x^2-16}{x^2-8x-20}$

11. $f(x) = \frac{\sqrt{5}}{x^2-3x}$

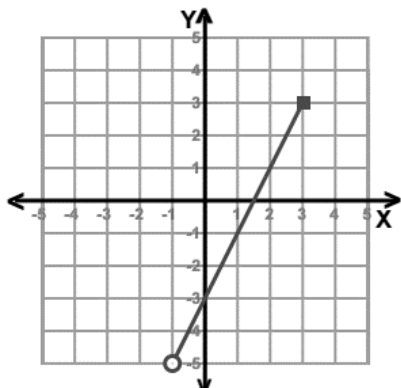
4. $f(x) = \frac{2x+3}{x-5}$

8. $f(x) = \frac{-2x^3}{3x^2+13x-10}$

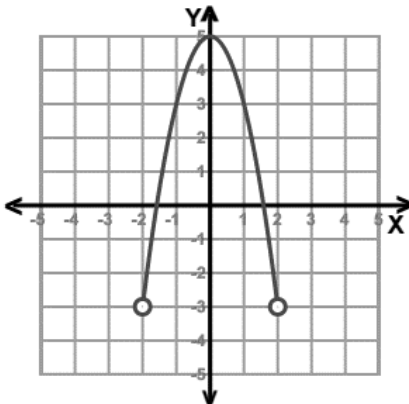
12. $f(x) = \frac{\sqrt{2x+5}}{x^2-16}$

Identify the domain and range in interval notation for each function graphed below:

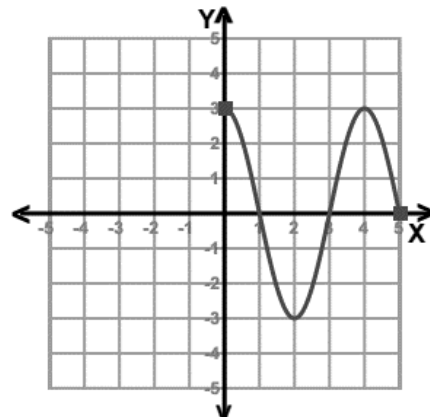
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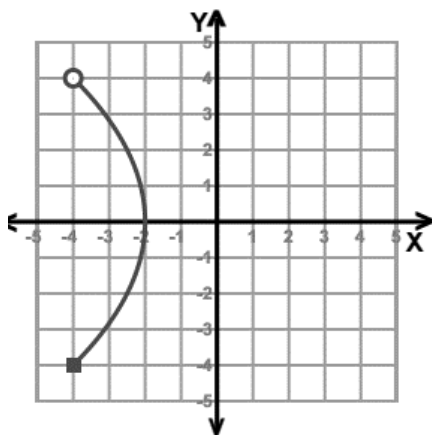
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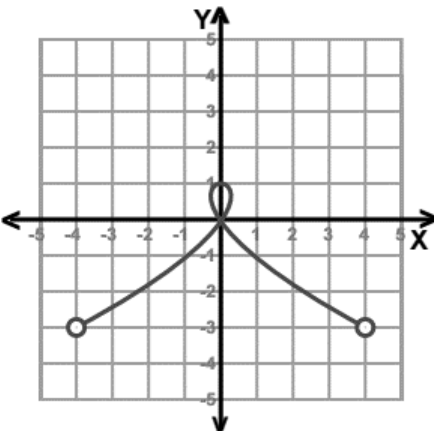
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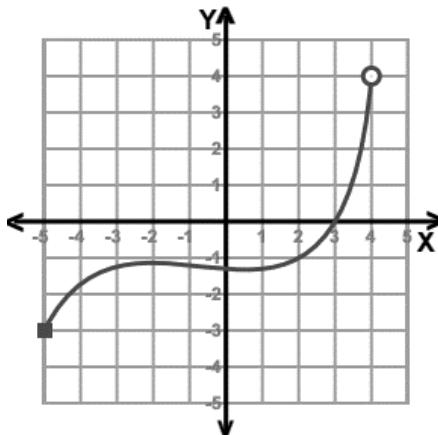
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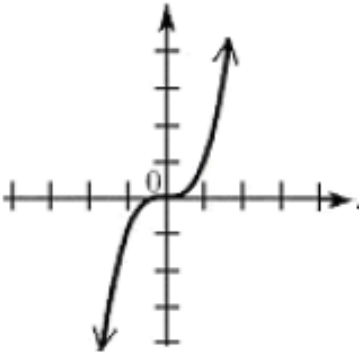
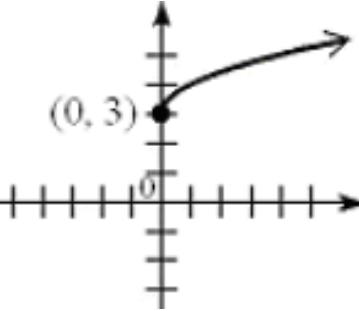
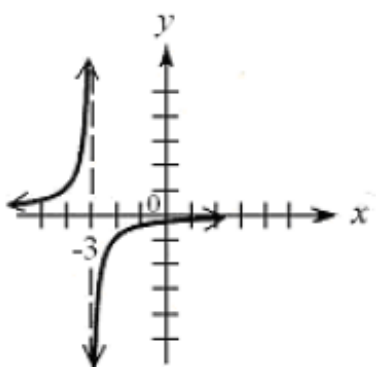
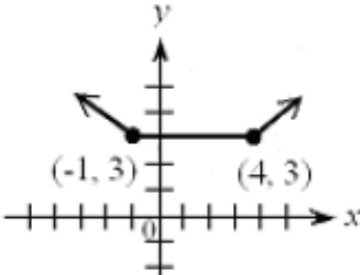
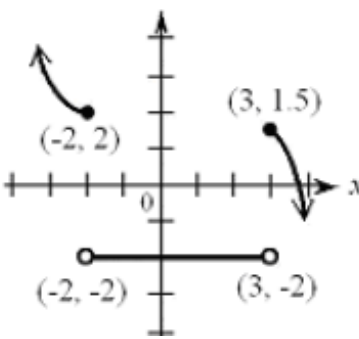
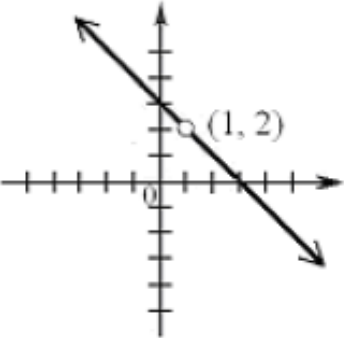


18.



4.2 Extrema, Symmetry, Etc.

Determine the intervals of the domain over which the function is increasing, decreasing, and constant.

<p>1.</p>  <p>Inc: _____ Dec: _____ Constant: _____</p>	<p>2.</p>  <p>Inc: _____ Dec: _____ Constant: _____</p>	<p>3.</p>  <p>Inc: _____ Dec: _____ Constant: _____</p>
<p>4.</p>  <p>Inc: _____ Dec: _____ Constant: _____</p>	<p>5.</p>  <p>Inc: _____ Dec: _____ Constant: _____</p>	<p>6.</p>  <p>Inc: _____ Dec: _____ Constant: _____</p>

Determine whether each function is even, odd, or neither.

7. $f(x) = 5x^3 + 2x$

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

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

12. $f(x) = 3x^2 - 5x + 1$

9. $f(x) = 3x^4 + 2x^2 - 5$

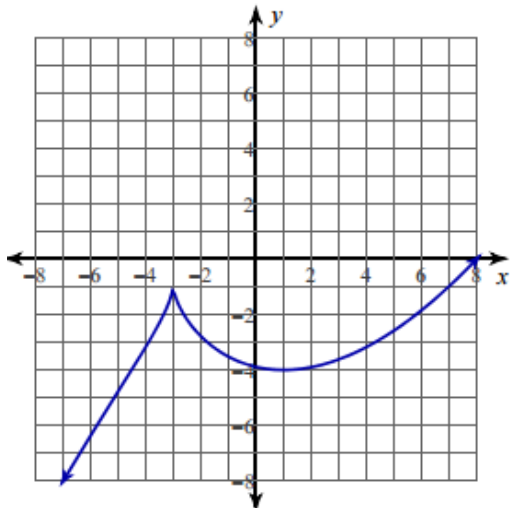
13. $f(x) = \sqrt{x^2 + 4}$

10. $f(x) = 12$

14. $f(x) = \sqrt[3]{x^3 - x}$

Identify the relative and absolute extrema for each function.

15.



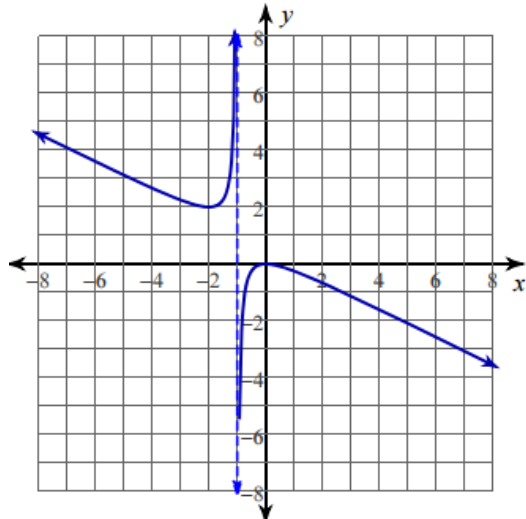
Relative Maximum(s) _____

Relative Minimum(s) _____

Absolute Maximum(s) _____

Absolute Minimum(s) _____

16.



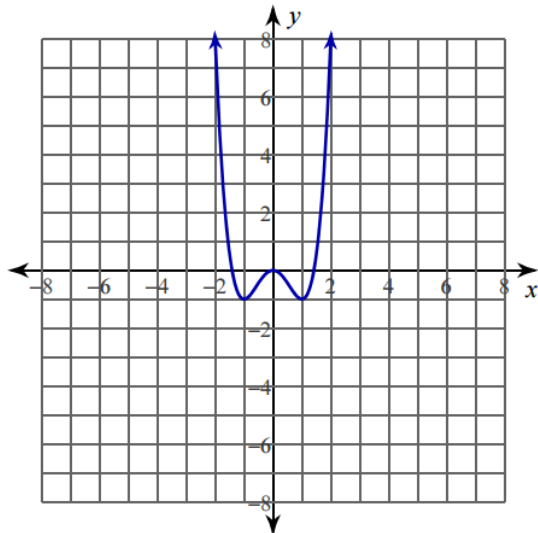
Relative Maximum(s) _____

Relative Minimum(s) _____

Absolute Maximum(s) _____

Absolute Minimum(s) _____

17.



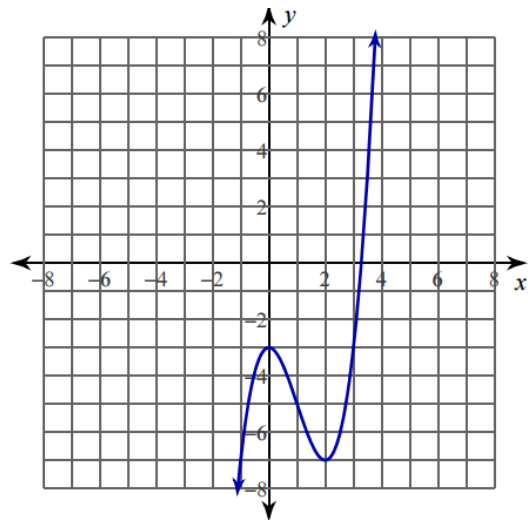
Relative Maximum(s) _____

Relative Minimum(s) _____

Absolute Maximum(s) _____

Absolute Minimum(s) _____

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Relative Maximum(s) _____

Relative Minimum(s) _____

Absolute Maximum(s) _____

Absolute Minimum(s) _____

4.3 Library of Functions

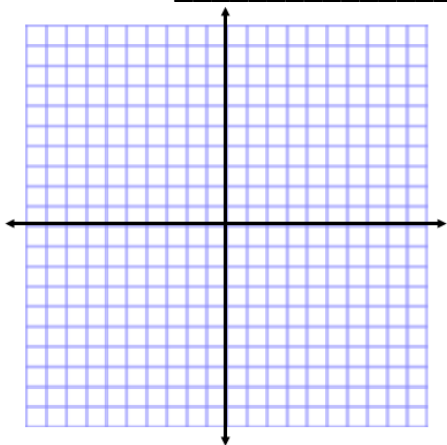
Students should complete their Library of Functions packet.

4.4 Transformations

Identify the parent function and describe the transformation. Then sketch the function.

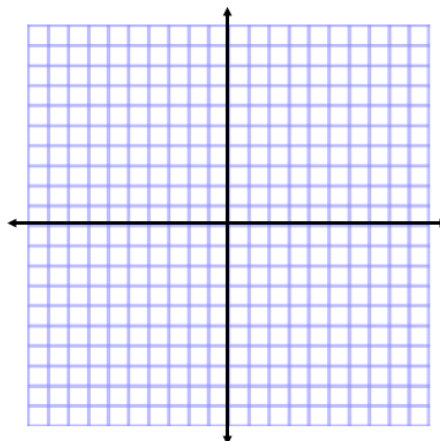
1. $g(x) = x^2 - 1$ Parent: _____

Transformations: _____



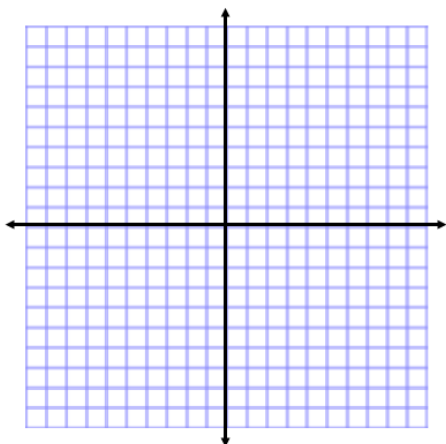
2. $f(x) = 2|x - 1|$ Parent: _____

Transformations: _____



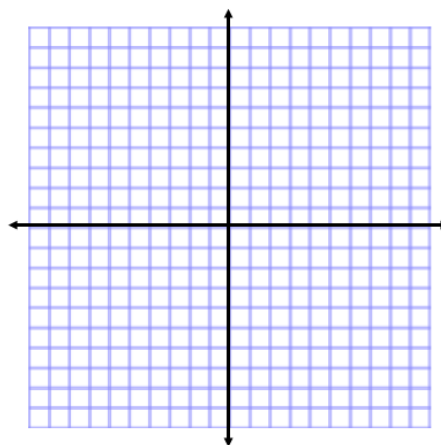
3. $h(x) = -3^x - 2$ Parent: _____

Transformations: _____



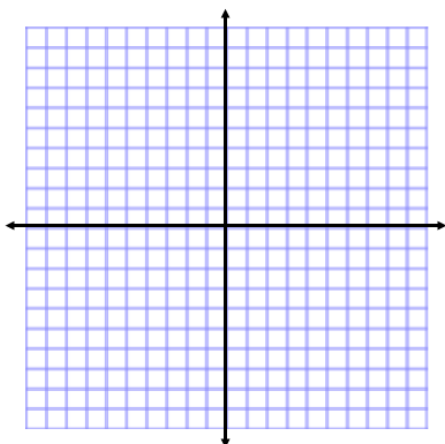
4. $g(x) = -2(x+1)^2 + 3$ Parent: _____

Transformations: _____



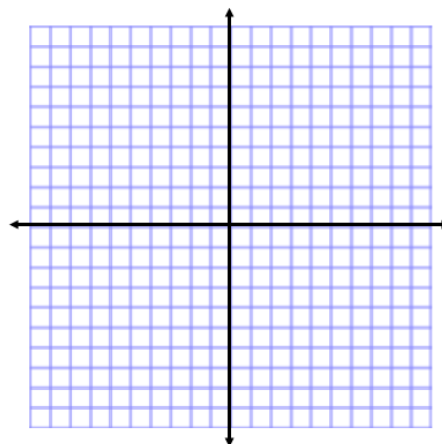
5. $f(x) = |x + 5| - 2$ Parent: _____

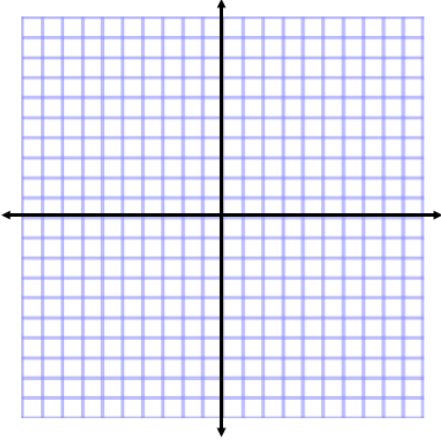
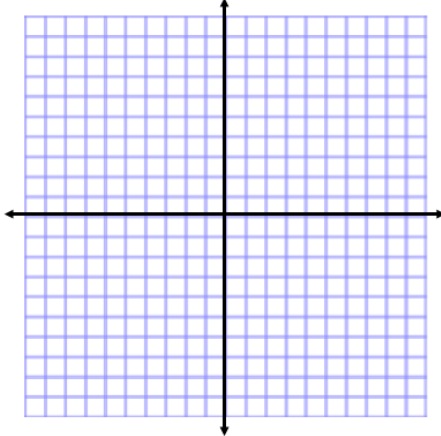
Transformations: _____



6. $h(x) = \log(x - 2) + 4$ Parent: _____

Transformations: _____



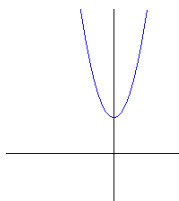
<p>7. $h(x) = -x^2 + 1$ Parent: _____</p> <p>Transformations: _____</p> 	<p>8. $h(x) = - x - 2$ Parent: _____</p> <p>Transformations: _____</p> 
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Given the parent function and description of the transformation, write the equation of the transformed function, $f(x)$.

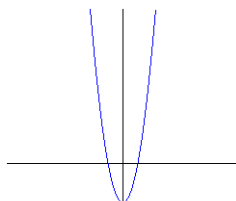
- 9. Absolute value—vertical shift up 5, horizontal shift right 3 _____
- 10. Linear—vertical compression by $\frac{2}{5}$ _____
- 11. Root —flipped over the x axis, vertical shift down 2 _____
- 12. Exponential—vertical stretch by 8 _____
- 13. Quadratic—vertical stretch by 5, horizontal shift left 8 _____

14. Which graph best represents the function $f(x) = 2x^2 - 2$?

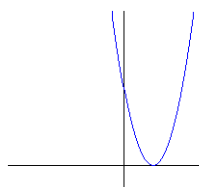
a.



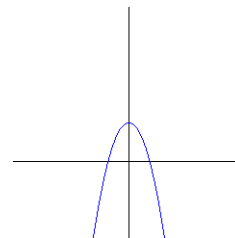
b.



c.



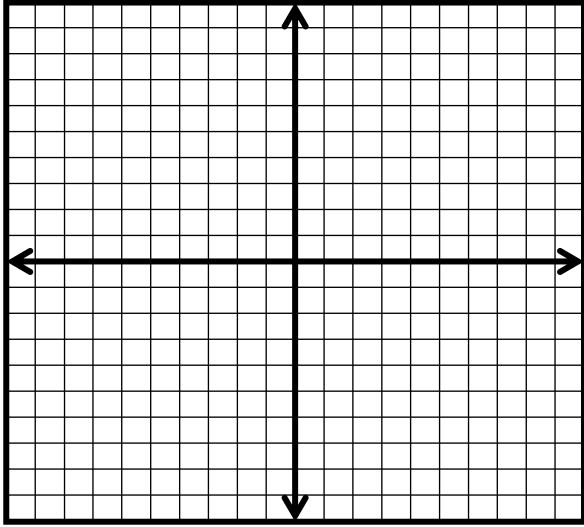
d.



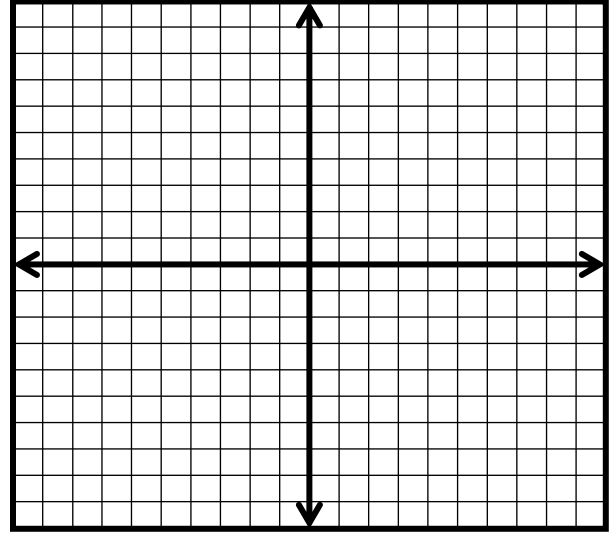
4.5 Piecewise Functions

Graph each function below. Then identify its domain and range.

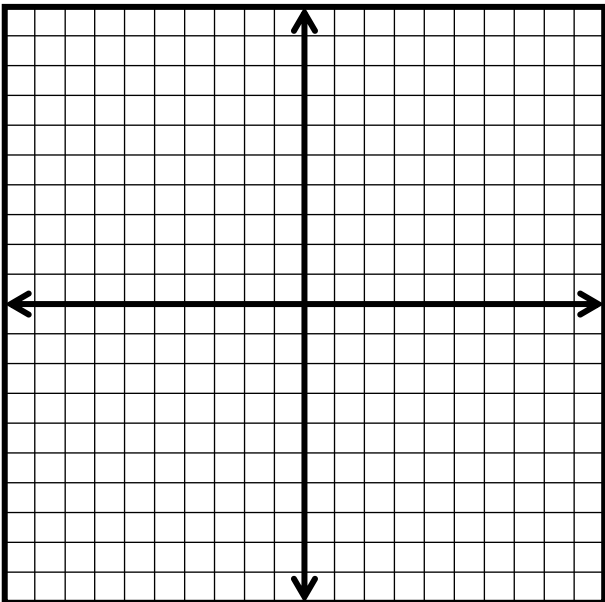
$$1. f(x) = \begin{cases} x & \text{if } x < 0 \\ -x + 3 & \text{if } 0 < x < 2 \\ -x^2 & \text{if } x \geq 2 \end{cases}$$



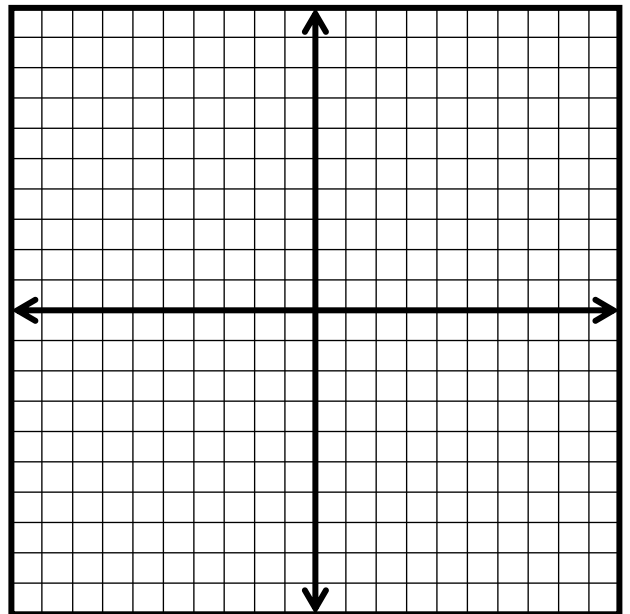
$$2. f(x) = \begin{cases} \sqrt{x} & \text{if } x \leq 3 \\ 4 & \text{if } 3 < x < 8 \\ \sqrt[3]{x} & \text{if } x \geq 8 \end{cases}$$



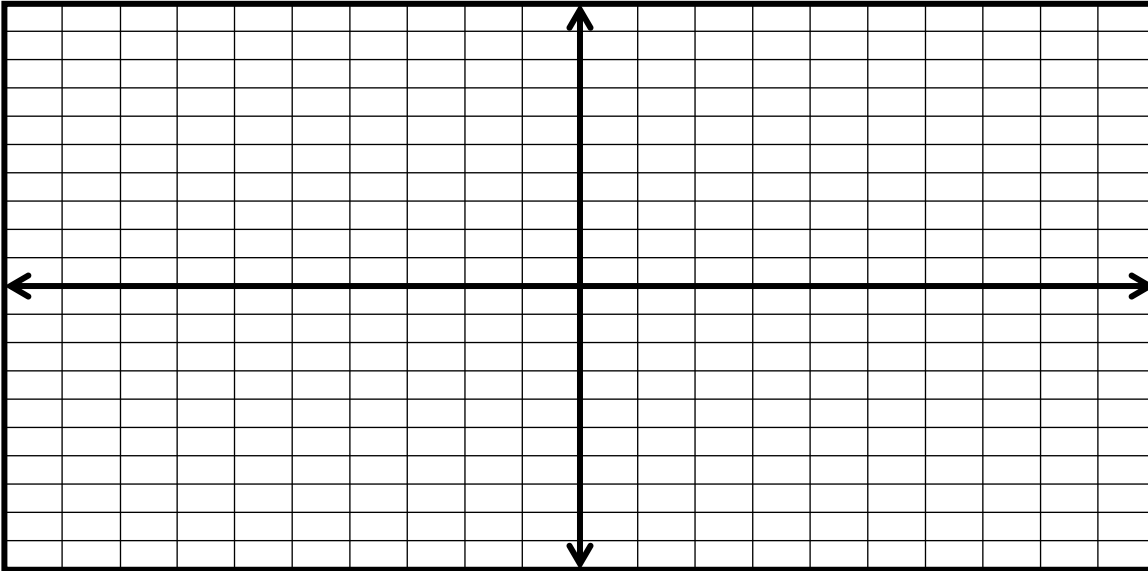
$$3. f(x) = \begin{cases} x^3 & \text{if } x \leq -1 \\ x & \text{if } -1 < x < 3 \\ \frac{1}{x} & \text{if } x \geq 3 \end{cases}$$



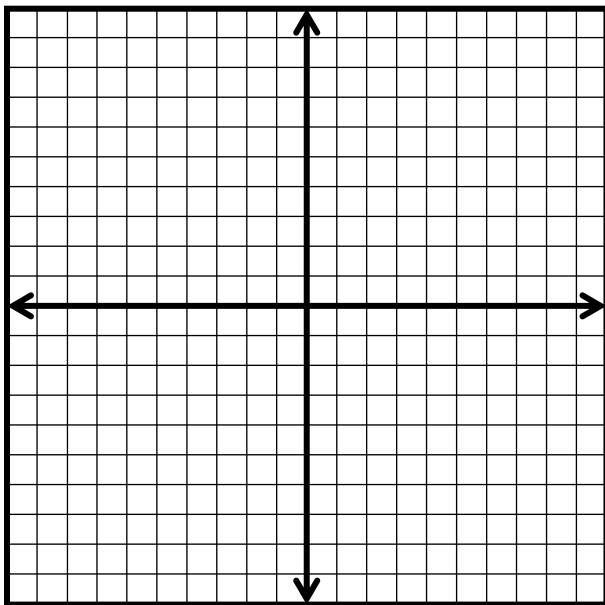
$$4. f(x) = \begin{cases} 2\sqrt{x} + 1 & \text{if } x \leq 2 \\ |x + 4| & \text{if } 3 < x < 5 \\ (x - 4)^2 & \text{if } x \geq 5 \end{cases}$$



$$5. f(x) = \begin{cases} \cos x & \text{if } x \leq 0 \\ \sin x + 3 & \text{if } 0 < x < 2\pi \\ \cos x & \text{if } x \geq 2\pi \end{cases}$$



$$6. f(x) = \begin{cases} |x| & \text{if } x < 2 \\ \frac{1}{x^2} + 4 & \text{if } 2 < x < 8 \\ \sqrt[3]{x} & \text{if } x \geq 8 \end{cases}$$



4.6 Combinations and Compositions

Given that $f(x) = 2x - 5$ and $g(x) = x^2 - 3x + 6$ find the following:

1. $(f + g)(x)$
2. $(f - g)(x)$
3. $(fg)(x)$
4. $\left(\frac{f}{g}\right)(x)$
5. Find $(f + g)(2)$
6. Find $(f - g)(3)$
7. Find $(fg)(-2)$
8. Find $\left(\frac{f}{g}\right)(6)$
9. Find $(f \circ g)(1)$
10. Find $(g \circ f)(-2)$

Given $f(x) = 2x^2 - 5x + 1$ and $g(x) = 2x - 3$ find the following:

11. $(f \circ g)(3)$
12. $(g \circ f)(1)$

Given that $f(x) = x^2 + 4$ and $g(x) = 3x + 6$ find the following:

13. $(f + g)(-4)$
14. $\left(\frac{f}{g}\right)(12)$
15. $(f \circ g)(x)$
16. $(g \circ f)(x)$
17. What is the domain of $\left(\frac{f}{g}\right)(x)$ in interval notation?

Find $(f \circ g)(1)$, $(g \circ f)(3)$, $(f \circ f)(0)$ for each of the following:

18. $f(x) = |x + 2|$ $g(x) = -x$
19. $f(x) = x$ $g(x) = -3$
20. $f(x) = x^2 - 1$ $g(x) = \sqrt{x}$

4.7 The Difference Quotient

- Given $f(x) = 4x^2$, find the following and simplify.
 - $f(x + h)$
 - $f(x + h) - f(x)$
 - $\frac{f(x+h)-f(x)}{h}$
 - If you let $h = 0$, what do you get from your answer to part (c) ?
- Given $f(x) = 2x^2 - x$, find the following and simplify.
 - $f(x + h)$
 - $f(x + h) - f(x)$
 - $\frac{f(x+h)-f(x)}{h}$
 - If you let $h = 0$, what do you get from your answer to part (c) ?
- Given $f(x) = 9 - \frac{1}{2}x^2$, find the following and simplify.
 - $f(x + h)$
 - $f(x + h) - f(x)$
 - $\frac{f(x+h)-f(x)}{h}$
 - If you let $h = 0$, what do you get from your answer to part (c) ?
- Given $f(x) = 1 - x^2$, find and simplify $\frac{f(x+h)-f(x)}{h}$. If you let $h = 0$, what does your answer become?
- Given $C(x) = 2x^2 - 4x + 3$, find and simplify $\frac{C(x+h)-C(x)}{h}$. If you let $h = 0$, what does your answer become?
- Given $p(q) = q^2 + 2q - 5$, find and simplify $\frac{p(q+h)-p(q)}{h}$. If you let $h = 0$, what does your answer become?

4.8 Inverse Functions

For Exercises 1 – 10, suppose $f(x) = 2x + 1$ and $g(x) = \frac{1}{2}(x - 1)$.

1. $f(g(-4)) =$
2. $g(f(-4)) =$
3. $f(g(1.5)) =$
4. $g(f(1.5)) =$
5. $f(g(1 + \sqrt{2})) =$
6. $g(f(1 - \sqrt{2})) =$
7. Are f and g inverse functions? Justify your answer.
8. True or False: If $f(g(2)) = g(f(2))$, then f and g are inverses.
9. If $(-3, 1)$ is in f , then _____ is in f' .
10. If -3 is the x-intercept of f , then _____ is the y-intercept of f' .

For Exercises 11 – 14, find $f^{-1}(x)$ if f has an inverse. If the function f has no inverse so state.

11. $f(x) = 1 - x^2$

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

13. $f(x) = \frac{2x-5}{3}$

14. $f(x) = 2 + |x|$

15. Find $f^{-1}(x)$ if $f(x) = \frac{1}{x} - 2$

16. The function g is graphed on the set of axes to the right. Sketch the graph of g^{-1} on the same set of axes.

