Name:____ Period: ___________

Accel. Pre-Calculus

Unit 11 Packet

Function Analysis

April & May 2021 Units 10 Function Analysis				
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26 **American Lit EOC in AM** 10.01 10 Basic Functions	27 **American Lit EOC in AM** 10.01 Finishing Reviewing Basic Functions	28 **Biology EOC in AM** 10.02 Boundedness, Even/Odd, Asymptotes HW: 10.02 Practice	29 **US History EOC in AM** 10.03 Transformations • Discovery • Chart HW: 10.03 Practice	30 **EOC in AM** 10.04 Extra Practice HW: 10.04 Practice
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Function Characteristics

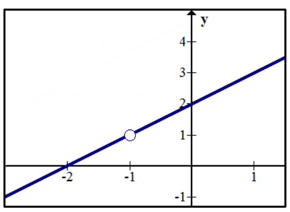
Asymptotes: Horizontal, Vertical, or Slanted lines that a function approaches but does not cross at the extremes.

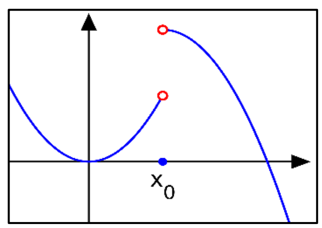
Boundedness: Vertical restrictions on a function.

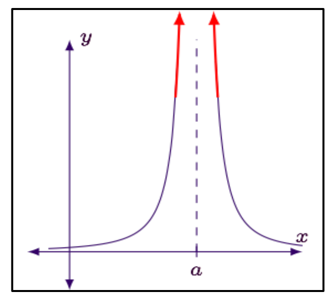
- *Bounded above*: The function has a value that it never climbs above.
- *Bounded below*: The function has a value that it never dips below.
- Or simply *bounded*: The function is both bounded above and bounded below.
- *Unbounded*: A function that is not bound.

Continuity: A function that is not connected.

- *Hole*, a form of *removable discontinuity*: a point at which a graph is not connected but can be made connected by filling in a single point.
- *Jump*, a form of *non-removable discontinuity*: the graph jumps from one piece of the graph to another.
- *Infinite*, a form of *non-removable discontinuity*: the graph has pieces to either side of a vertical asymptote that approach infinity.







Domain: All values of x where the function is defined.

End Behavior: What the function is doing toward the end of the graph.

- Is it increasing without bound (∞)?
- Is it decreasing without bound ($-\infty$)?
- Is it approaching a specific value (like a horizontal asymptote)?
- $as\ x \to \infty, f(x) \to$ _?_ What is the function doing as it goes off the right side of the graph?
- $as\ x \to -\infty, f(x) \to$ _?_ What is the function doing as it goes off the left side of the graph?

Extrema: The maximum and minimum function values that it reaches.

- *Absolute extrema*: The highest (or lowest) value the function ever reaches.
- *Relative extrema*: A high (or low) value the function reaches for a certain interval of x-values.

Intercepts: The point where the graph intersects an axis.

- *x-intercepts*: found where the graph crosses the x-axis, when y = 0. Also known as *roots* or *zeros*.
- *y-intercepts*: found where the graph crosses the y-axis, when x = 0.

Range: All values of y that a function can be.

Transformations: Changes made to a parent graph to create a different but related function.

- *Vertical stretch/compress*
- *Horizontal stretch/compress*
- *Vertical shift*
- *Horizontal shift*
- *Vertical Reflection*
- *Horizontal Reflection*

Name	Graph	Algebraic Equation	Continuity	Extrema	End Behavior	Symmetry	Asymptotes	Domain & Range
Identity Function **Or Linear Function**		$y = x$						
Quadratic Function		$y = x^2$						
Cubic Function		$y = x^3$						
Rational Function **Or Reciprocal Function**		$y = \frac{1}{x}$						
Square Root Function		$y = \sqrt{x}$						

Name	Graph	Algebraic Equation	Continuity	Extrema	End Behavior	Symmetry	Asymptotes	Domain & Range
Absolute Value Function		$y = \| x \|$						
Exponential Function		$y = e^x$ Or $y = a^x$						
Logarithmic Function		$y = \log_b x$ Or $y = \ln x$						
Sine Function		$y = \sin x$						
Greatest Integer Function **Or Step Function**		$y = [x]$						

10.02 Function Properties **Date: ___________________**

1. **Function versus Not a Function:**

2. **Domain:**

   - All real numbers, $\mathbb{R}$:

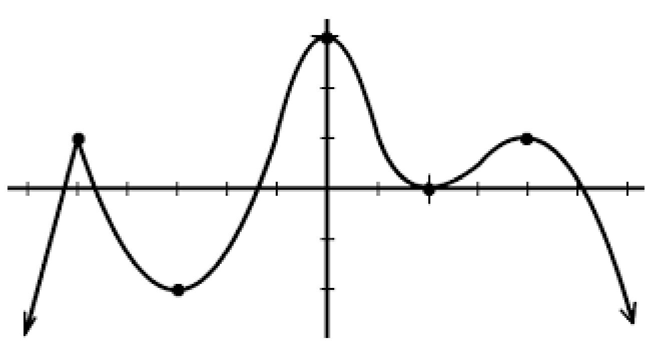
   - What causes a function to *not exist* for an input value?

3. **Range:**

   - All real numbers, $\mathbb{R}$:

   - What causes a function to *not exist* for an output value?

4. **Intervals of Increase and Decrease:**



5. Boundedness:

6. Symmetry:

Even Function

Odd Function

Determine if the function is even, odd, or neither.

a) $f(x) = 3x^4 + 7x^3 - 2x + 1$

b) $g(x) = 5x^6 + 3x^2 - 8$

c) $h(x) = 3\sin(x)$

d) $j(x) = -\frac{4}{x}$

7. Asymptotes and Holes in Rational Functions:

Holes:

Example: $f(x) = \frac{x+4}{x^2-16}$

Vertical Asymptotes:

Example: $g(x) = \frac{2x^2-9x-5}{x^2-8x+15}$

Horizontal Asymptotes:

- $y = 0$ Example:

- $y = \frac{leading\ coefficient}{leading\ coeffcient}$ Example:

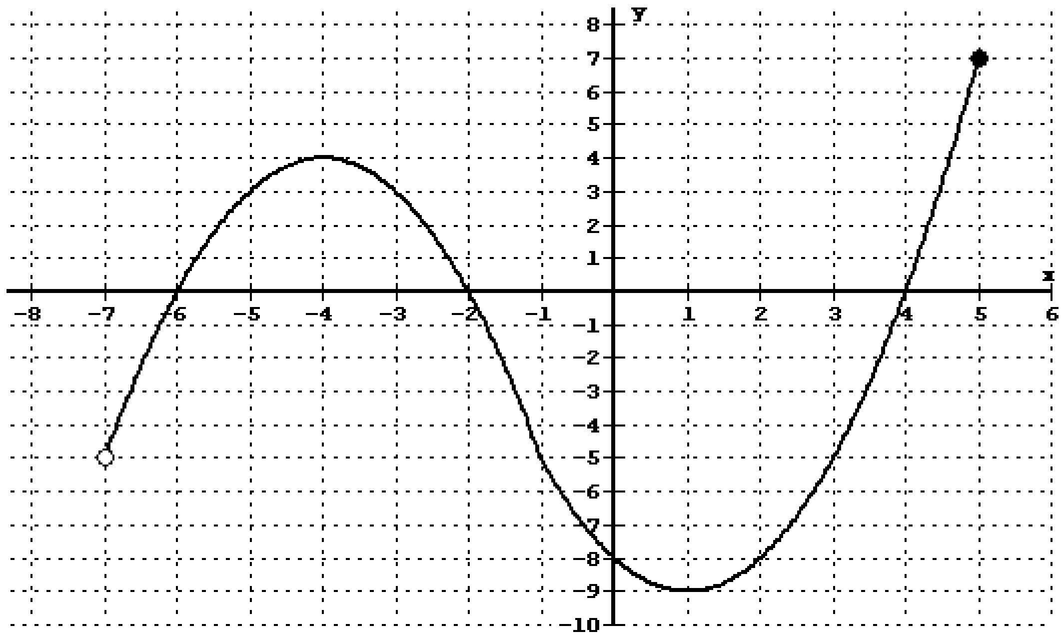
- Does not exist Example:

8. Continuity versus Discontinuity:

9. End Behavior:

10.02 Practice: Date: ________________

Analyze the Graph



Use the graph to find each.

1. x-intercept(s):

2. y-intercept(s):

3. Is this a function?

4. Domain:

5. Range:

6. Where is $f(x) < 0$?
   List the x-values, interval notation.

7. Where is $f(x) \geq 0$?
   List the x-values, interval notation.

8. Find $f(2)$.

9. Find $f(-5)$.

10. State the graph's boundedness:

11. How many times does the line $y = 2$ intersect the graph?

12. Is the graph even, odd, or neither?

13. Where does $f(x) = 4$?

14. Where does $f(x) =$ -5?

15. Find $f(-1) - f(2)$.

16. Find $3f(1)$.

17. Absolute Maximum value:

18. Absolute Minimum value:

19. Relative Maximum value:

20. Relative Minimum value:

21. Where is the graph increasing?

    State the x-values, interval notation.

22. Where is the graph decreasing?

    State the x-values, interval notation

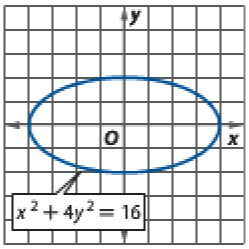
23. Is the graph continuous? If not, what type of discontinuity does it have?

10.02 Practice **Date: ___________________**

For the equations graphed in #24 – 31:

A) State if the graph shows a function or not a function
B) State if bounded above, bounded below, bounded, or not bounded
C) State if even, odd, or neither
D) If it is a function, state the intervals of increase, decrease, and constant. (Use interval notation.)

24.



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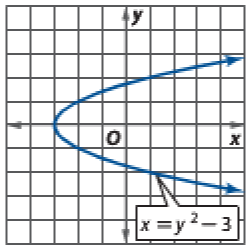

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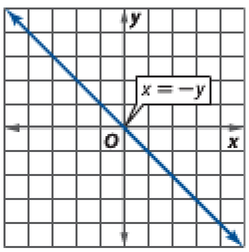

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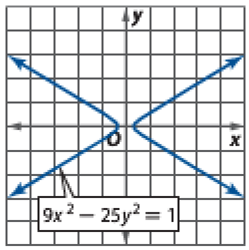

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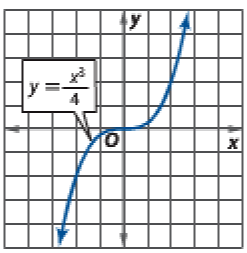

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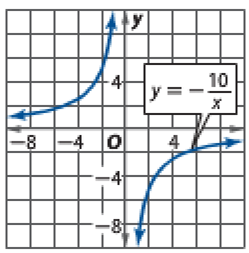

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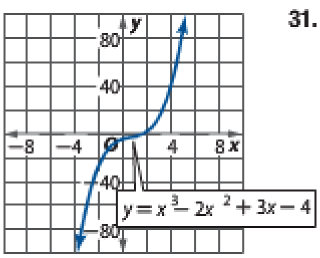

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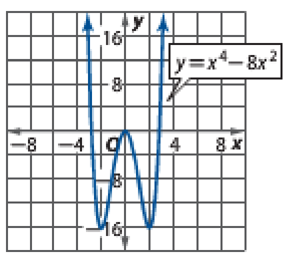


State if the function is bounded above, bounded below, bounded, or not bounded.

1. $f(x) = |x + 2| - 1$

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

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

4. $f(x) = 2\sin(\theta) - 3$

Determine algebraically whether the function is <u>even</u>, <u>odd</u>, or <u>neither</u>.

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

6. $f(x) = x^4 + 3x^2 + 8$

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

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

Find all vertical asymptotes, horizontal asymptotes, and/or holes.

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

Holes: ________________________________

Vertical Asymptotes: ____________________

Horizontal Asymptote: __________________

10. $f(x) = \frac{4x-4}{x^2-9}$

Holes: ________________________________

Vertical Asymptotes: ____________________

Horizontal Asymptote: __________________

11. $f(x) = \frac{x^2-2x}{x^3-5x^2+6x}$

Holes: ________________________________

Vertical Asymptotes: ____________________

Horizontal Asymptote: __________________

12. $f(x) = \frac{5x^2+2}{3x^2-12}$

Holes: ________________________________

Vertical Asymptotes: ____________________

Horizontal Asymptote: __________________

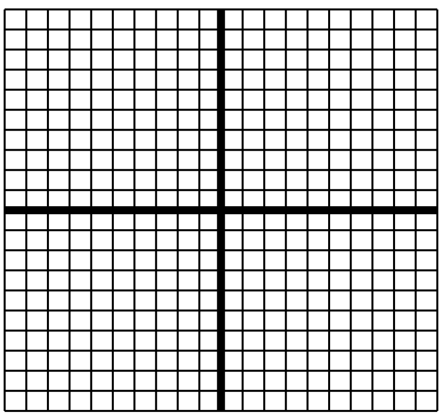
10.03 Discovery of Transformations **Date: ________________**

For each function graph the parent and the transformations on the same graph. Use different colors for each. Then compare and describe any changes.

Parent: $y = x^2$

1. $y = x^2 + 2$
2. $y = x^2 - 3$

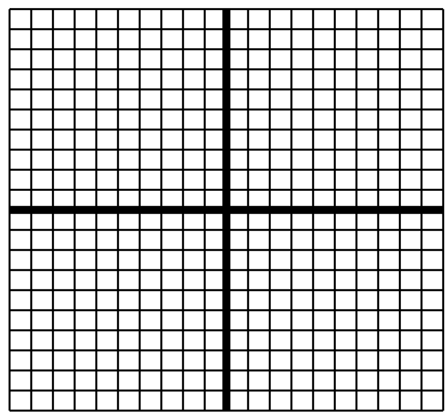
How did $y = x^2$ change?



Parent: $y = x^3$

1. $y = (x - 3)^3$
2. $y = (x + 2)^3$

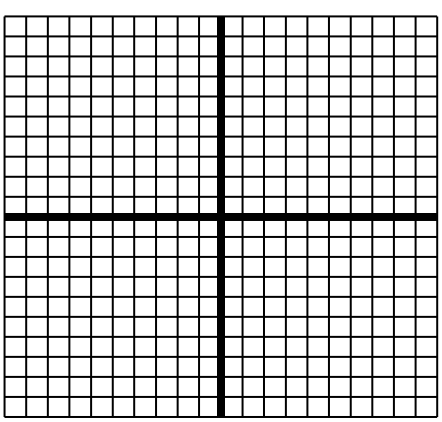
How did $y = x^3$ change?



Parent: $y = |x|$

1. $y = 4|x|$
2. $y = 0.25|x|$

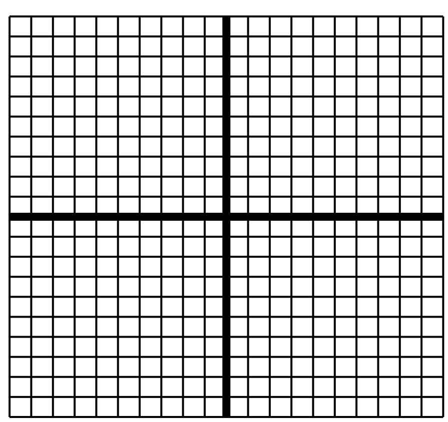
How did $y = |x|$ change?



Parent: $y = \sqrt{x}$

1. $y = -\sqrt{x}$
2. $y = \sqrt{-x}$

How did $y = \sqrt{x}$ change?



Type of Transformation	Algebraic Formula	Variable Notes	Example
Vertical: **Translation**			
Vertical: **Dilation**			
Vertical: **Reflection**			
Horizontal: **Translation**			
Horizontal: **Dilation**			
Horizontal: **Reflection**			

10.03 Practice **Date: ____________________**

Given the parent function, describe the graph of each related function.

1. $\boldsymbol{f(x) = x^2}$

a. $f(x) = -(4x)^2$

b. $f(x) = 4x^2$

c. $f(x) = (0.25x - 3)^2$

2. $\boldsymbol{f(x) = |x|}$

a. $f(x) = \frac{1}{2}|x + 2|$

b. $f(x) = |-x| - 7$

c. $f(x) = \left|\frac{5}{3}x\right|$

Write the function that is obtained from the following transformations.

1. $f(x) = x^3$; shift left 1, down 5, reflected over the x-axis.

2. $f(x) = |x|$; vertical stretch of 4, reflected over the y-axis.

3. $f(x) = \frac{1}{x}$; shifted right 2, up 9

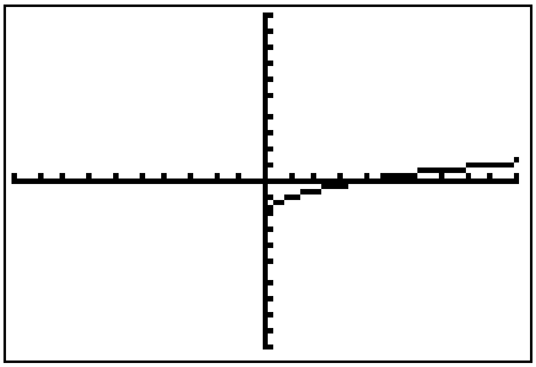
4. $f(x) = x^2$; reflected over the x-axis, horizontally stretched (compressed) to 2/3 the width, and shifted down 1

10.04 More Practice with Function Transformations **Date: ____________**

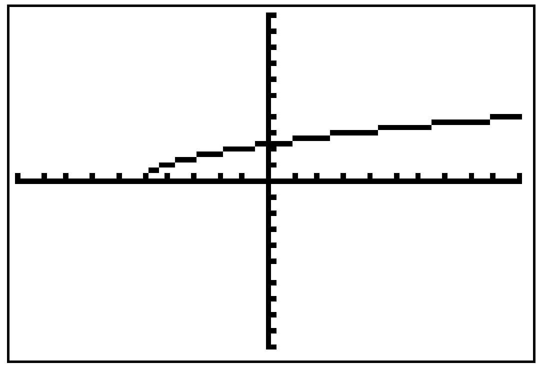
For Questions 1-4: Match each of the following functions to its graph.

1. $y = \sqrt{x+5}$ _____ 2. $y = \sqrt{x} - 2$ ______ 3. $y = \sqrt{x-3}$ ______ 4. $y = 2\sqrt{-x}$ ______

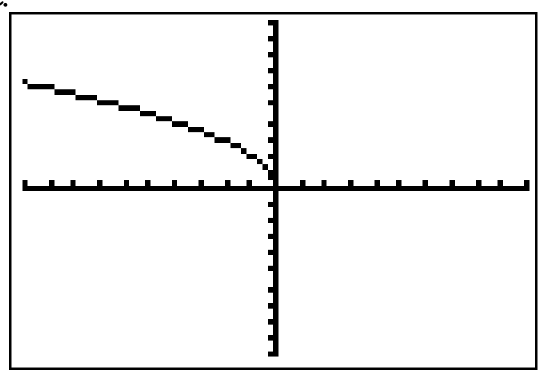
A.



B.



C.



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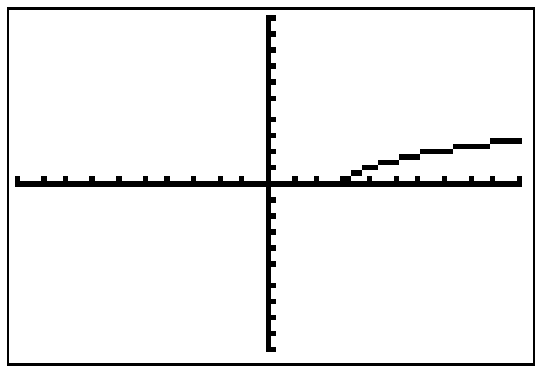


5. Given the function $\boldsymbol{f(x) = x^2}$, write the function whose graph of $\boldsymbol{f(x)}$ is:

a. shifted 6 units to the left

b. reflected about the y-axis

c. reflected about the x-axis

d. shifted 5 units up

e. vertically stretched by a factor of 4

f. vertically stretched (compressed) by a factor of $^1/_3$

6. Given the function $(\boldsymbol{x}) = \frac{\mathbf{1}}{\boldsymbol{x}}$; write the function whose graph of $\boldsymbol{f(x)}$ is:

a. shifted 4 units to the right

b. reflected about the y-axis

c. reflected about the x-axis

d. shifted 2 units down

e. vertically stretched by a factor of 3

f. vertically stretched (compressed) by a factor of $^1/_4$

7. Use your knowledge of transformations to describe how the parent function, $f(x)$, changes into the related function, $g(x)$.

a. $f(x) = x^2$
$g(x) = x^2 + 5$

b. $f(x) = x^3$
$g(x) = (x-1)^3$

c. $f(x) = |x|$
$g(x) = -2|x|$

d. $f(x) = \sqrt{x}$
$g(x) = \frac{1}{3}\sqrt{x}$

e. $f(x) = \sin x$
$g(x) = \sin(x-2) - 4$

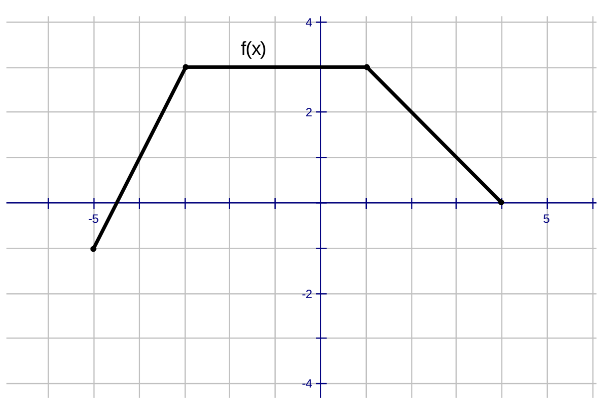
f. $f(x) = \frac{1}{x}$
$g(x) = \frac{1}{x+4} + 2$

g. $f(x) = e^x$
$g(x) = -e^{x+2} - 7$

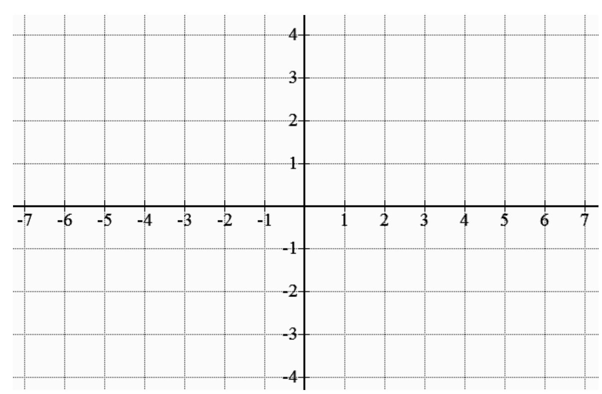
h. $f(x) = \cos x$
$g(x) = 3\cos(2x)$

i. $f(x) = \log x$
$g(x) = -\log(-x)$

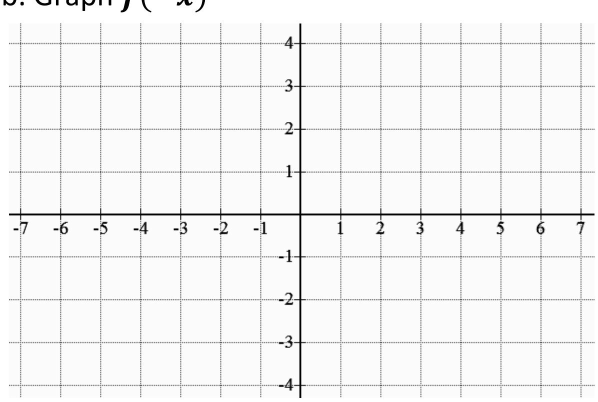
8. Consider the following graph of the function $\boldsymbol{f(x)}$:



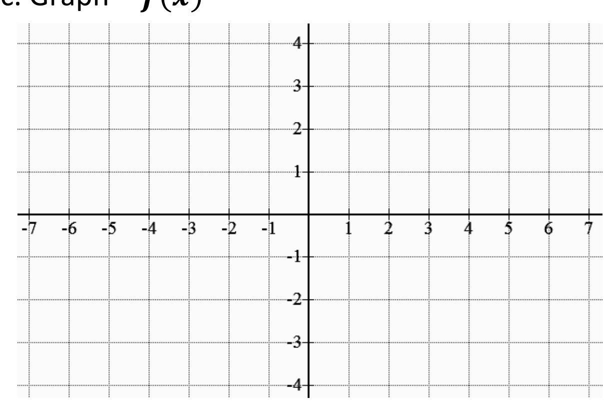
a. Graph $\boldsymbol{f(x-3)+1}$



b. Graph $\boldsymbol{f(-x)}$



c. Graph $\boldsymbol{-f(x)}$



10.05 Function Combination and Composition **Date: ____________________**

Notation:		**use $f(x) = x + 2$ and $g(x) = x - 3$**	**Domain**
$(f+g)(x)$			
$(f-g)(x)$			
$(f*g)(x)$			
$(f/g)(x)$ Or $\left(\frac{f}{g}\right)(x)$			
$(f \circ g)(x)$			

Example 1: Find the combinations using $f(x) = \sqrt{x}$ and $g(x) = x^2 - 4$. Identify any domain restrictions.

$(f+g)(x)$

$(f-g)(x)$

$(f*g)(x)$

$(f/g)(x)$

Example 2: Evaluate the combinations using $f(x) = 4x^2 + 9$ and $g(x) = x^2 - 3x + 1$.

$(f-g)(1)$

$(f*g)(4)$

Example 3: Find the function compositions using $f(x) = 2x^2 - x$ and $g(x) = -12x + 7$. Identify any domain restrictions.

$(f \circ g)(x)$ $(g \circ f)(x)$

Example 4: Find the function compositions using $f(x) = \log x$ and $g(x) = 3 - x$. Identify any domain restrictions.

$(f \circ g)(x)$ $(g \circ f)(x)$

Example 5: Evaluate the function compositions using $f(x) = 5x + 3$ and $g(x) = 3x^2$.

$(f \circ g)(4)$ $g(f(2))$ $(f \circ f)(-3)$

10.05 Practice **Date:** ____________________

State the domain of each given function. Then, evaluate each combination at the given value.

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

   $g(x) = 2x + 1$

   Find $(f \cdot g)(-1)$

2. $w(x) = \frac{9}{x+10}$

   $z(x) = \log_4 x$

   Find $(w + z)(2)$

3. $h(x) = 5x - 2$

   $j(x) = -2x^2 + 7$

   Find $(h - j)(0)$

4. $m(x) = x^2$

   $t(x) = \sqrt{x - 4}$

   Find $(t/m)(5)$

5. $j(x) = \frac{x}{x+1}$

   $k(x) = 9 - x^2$

   Find $(j \circ k)(4)$

6. $a(x) = x^2 + 7$

   $b(x) = \sqrt{x + 13}$

   Find $(b \circ a)(-4)$

State the domain of each given function. Then, perform the indicated operation and determine the domain of the new function.

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

   $g(x) = x^2 + x$

   Find $(f + g)(x)$

8. $m(x) = (x - 1)^2$

   $p(x) = 3 - x$

   Find $(m - p)(x)$

9. $u(x) = \frac{1}{x-2}$

   $v(x) = x^2 - 4$

   Find $(uv)(x)$

10. $c(x) = \sqrt{x + 3}$

    $d(x) = 4x^2 + 1$

    Find $\left(\frac{d}{c}\right)(x)$

11. $n(x) = x^2 + 4x + 3$

    $z(x) = \log(x + 1)$

    Find $(z \circ n)(x)$

12. $r(x) = \sqrt{x}$

    $t(x) = \frac{1}{x-1}$

    Find $t(r(x))$

10.06 Piecewise Function Notes

Date: ________________

What is the graph of $y = x$?

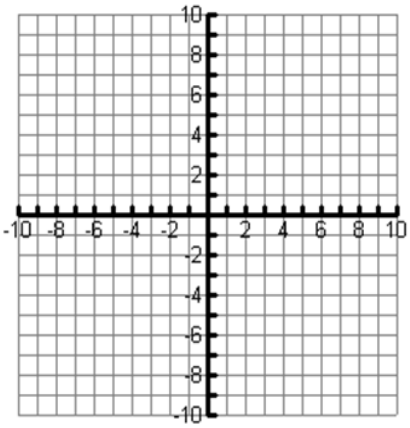
What if you only want a ray?

Or only want a segment?

Evaluate the function at the given values. Then, graph the piecewise function.

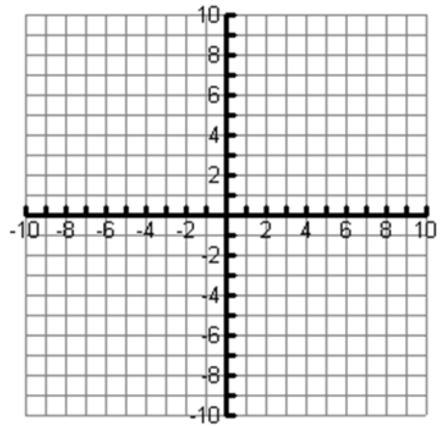
1. $f(x) = \begin{cases} \frac{1}{2}x - 1 & if\ \ x \le -2 \\ -2x - 1 & if\ \ x > -2 \end{cases}$

Evaluate: a) $f(0)$ b) $f(4)$

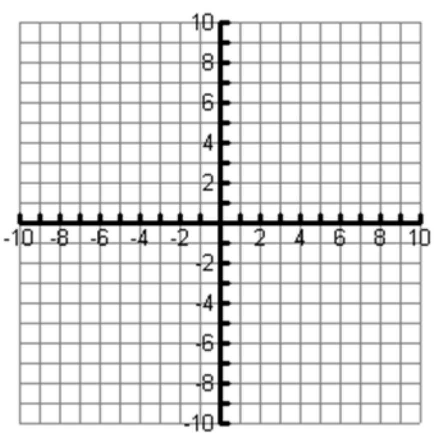


2. $g(x) = \begin{cases} -(x+4)^2 + 8 & if\ \ -7 < x \le -2 \\ 2 & if\ \ -2 < x \le 4 \\ 6 - x & if\ \ 4 < x \le 8 \end{cases}$

Evaluate: a) $g(-2)$ b) $g(5)$

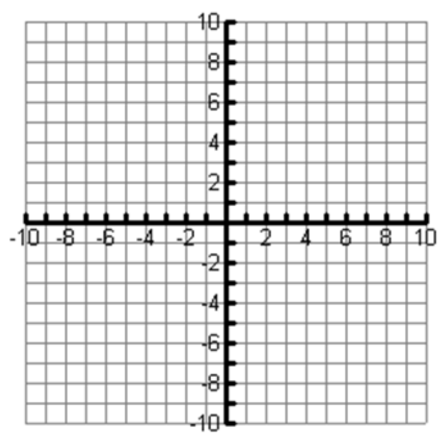


3. $q(x) = \begin{cases} -x - 5 & if\ \ x < -1 \\ 2^x & if\ \ -1 \le x \le 3 \\ 4 & if\ \ x > 3 \end{cases}$



Domain: Range:

4. $r(x) = \begin{cases} \frac{3}{2}x + 4 & if\ \ -6 < x \le -2 \\ -x^3 & if\ \ -2 < x \le 2 \\ 2|x - 3| - 4 & if\ \ 2 < x \le 7 \end{cases}$



Domain: Range:

10.06 Practice **Date: ____________________**

Evaluate the piecewise function when (a) $x = -1$, (b) $x = 0$, and (c) $x = 2$.

1. $f(x) = \begin{cases} x^2 - 3 & if \quad x < 0 \\ 8 & if \quad x \geq 0 \end{cases}$

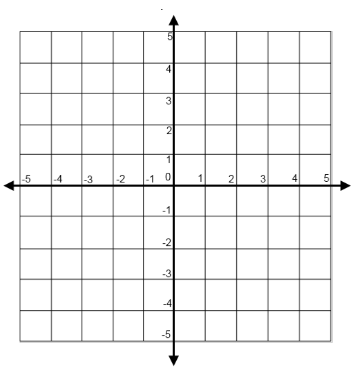
2. $g(x) = \begin{cases} \frac{3x+1}{x-5} & if \quad x < -3 \\ \log(-x) & if \quad -3 \leq x < 0 \\ 3^x & if \quad x \geq 0 \end{cases}$

Graph the piecewise function. State the domain and range of the function.

3. $t(x) = \begin{cases} x + 2 & if \quad x < 0 \\ \frac{1}{3}x - 1 & if \quad x \geq 0 \end{cases}$

Domain:

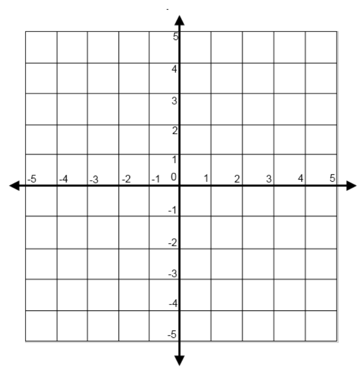
Range:



4. $v(x) = \begin{cases} 2 & if \quad -3 \leq x < 1 \\ (x-2)^2 + 1 & if \quad 1 \leq x \leq 4 \end{cases}$

Domain:

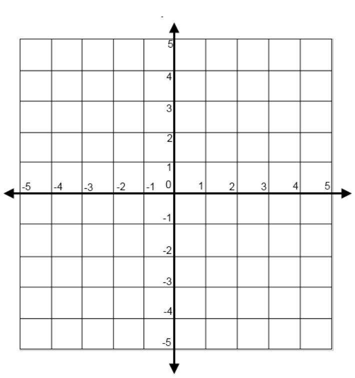
Range:



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

Domain:

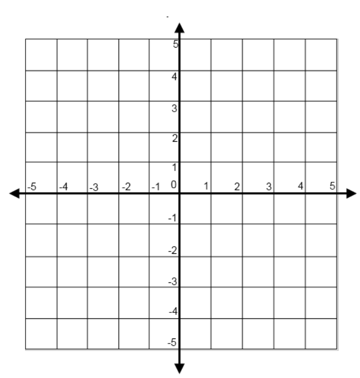
Range:



6. $r(x) = \begin{cases} \log_3(x+4) & if \quad -4 < x \leq -1 \\ |x-1| - 1 & if \quad -1 < x \leq 2 \\ -\frac{3}{2}x + 3 & if \quad x > 2 \end{cases}$

Domain:

Range:

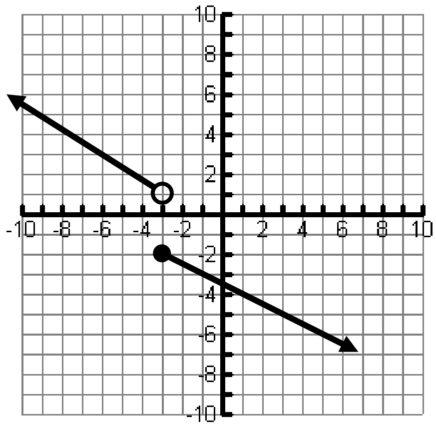


10.07 Writing the Piecewise Notes

Date: ________________

Write the equation for the piecewise function that is shown. Remember to include the domain restrictions for each piece. Then answer the questions about the characteristics of the function.

1.



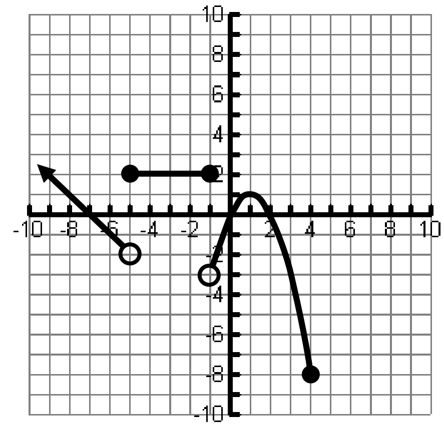
$f(x) = \{$

Domain: ________________

Range: __________________

Is the graph continuous? ______

2.



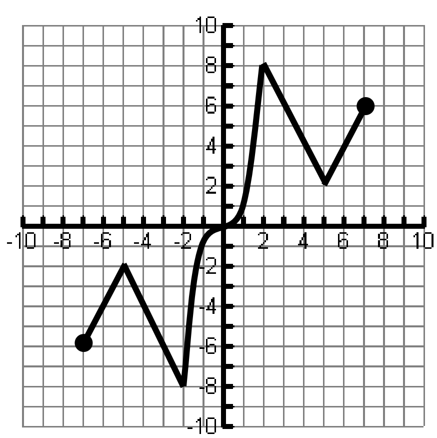
$f(x) = \{$

Intervals of Increase: ________________

Intervals of Decrease: ________________

Intervals of Constant: ________________

3.



$f(x) = \{$

Symmetry: _______________

Boundedness: ________________

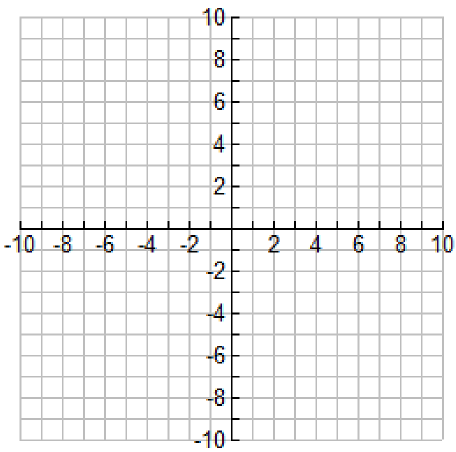
Extrema: ____

____

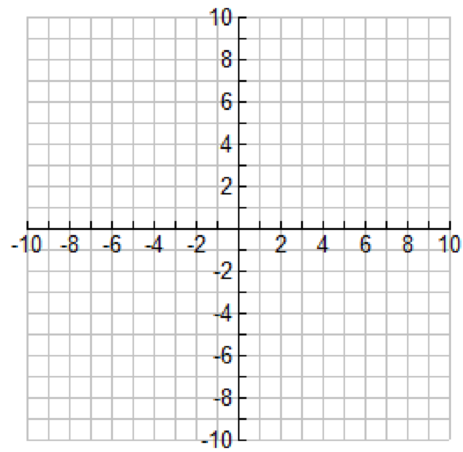
10.07 Practice **Date: ________________**

Graph the following piecewise functions.

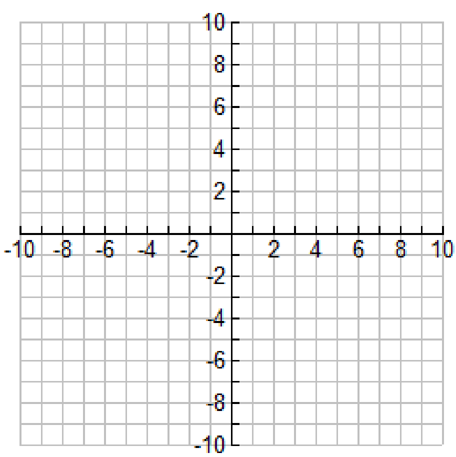
1. $f(x) = \begin{cases} 3x - 5, & if\ x \le 2 \\ -(x-3)^2 + 4 & if\ x > 2 \end{cases}$



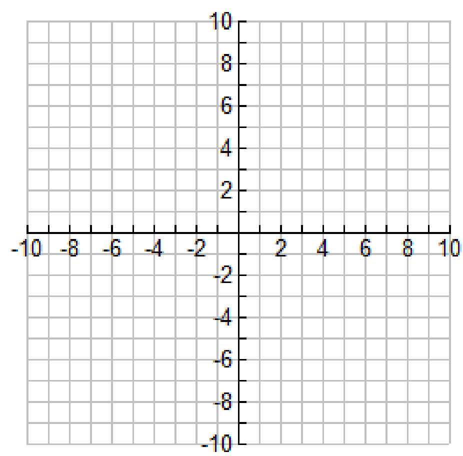
2. $g(x) = \begin{cases} (x+2)^2 & if\ \ x \le 0 \\ 2 - x & if\ \ x > 0 \end{cases}$



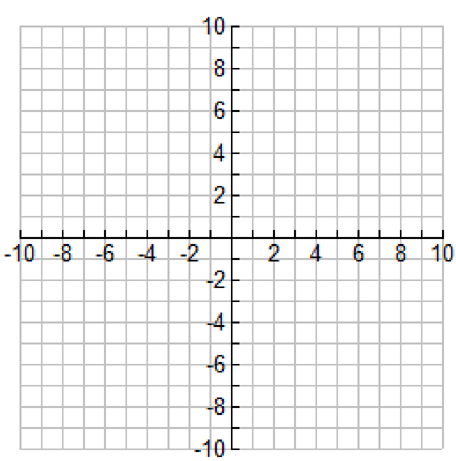
3. $f(x) = \begin{cases} 3 - 2x & if\ x < \frac{3}{2} \\ 2x - 3 & if\ x \ge \frac{3}{2} \end{cases}$



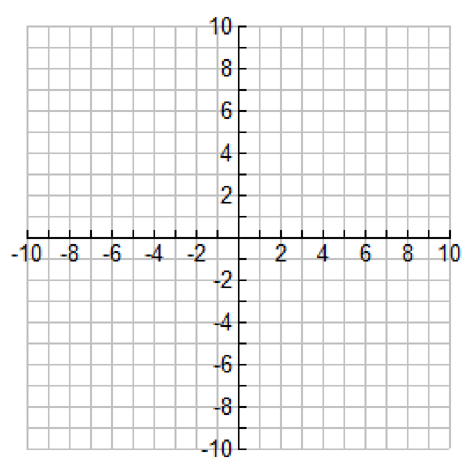
4. $g(x) = \begin{cases} x^3 & if\ \ x < 1 \\ \sqrt{(x-1)} + 1 & if\ \ x \ge 1 \end{cases}$



5. $f(x) = \begin{cases} 2 & x < 0 \\ -\frac{3}{2}x + 2 & 0 \le x \le 3 \\ \frac{1}{2}(x-4)^3 - 2 & x > 3 \end{cases}$

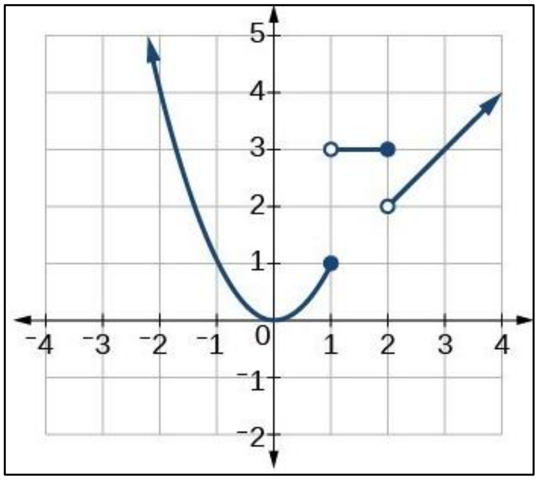


6. $g(x) = \begin{cases} |x+6| & x \le -2 \\ \left(\frac{1}{2}\right)^x & x > -2 \end{cases}$



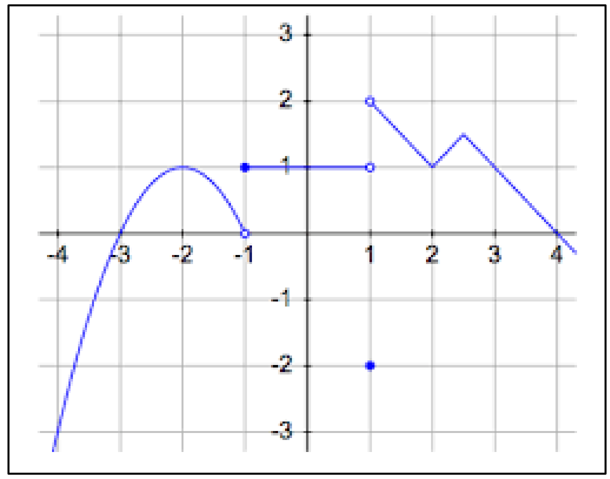
Write the equation for the piecewise function that is graphed. Assume that the domain for each is $(-\infty, \infty)$.

7. There are 3 pieces!



$f(x) = \Bigg\{$

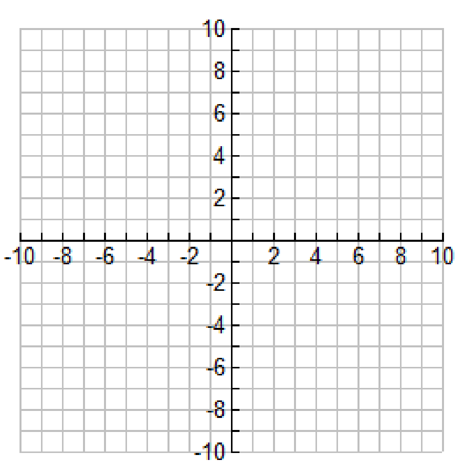
8. There are at least 5 pieces!



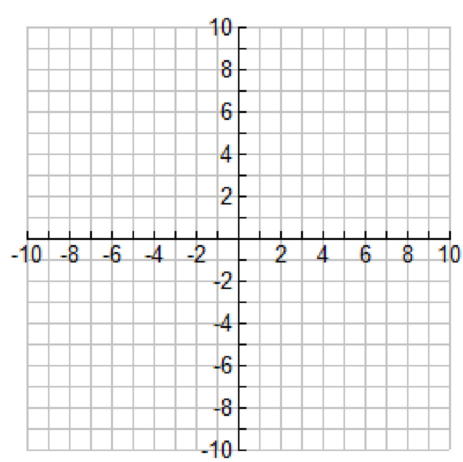
$f(x) = \Bigg\{$

Absolute value functions can be expressed as a piecewise function with two linear pieces, one for each ray that meet at the vertex.

11. Express $f(x) = 4|x + 2|$ as a piecewise function and graph $f(x)$.



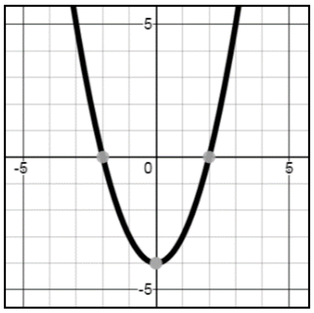
12. Express $f(x) = -2|x - 6| + 3$ as a piecewise function and graph $f(x)$.

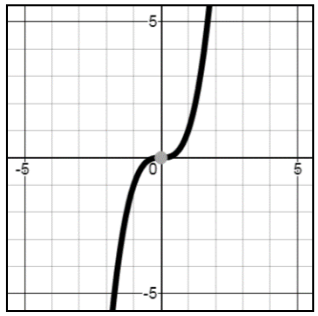


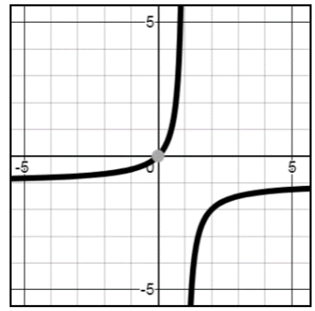
10.08 Analysis of Functions Review Date: ________________________

Functions: be able to name and sketch each of the 10 basic (parent) functions.

Symmetry: label each graph as even, odd, or neither.







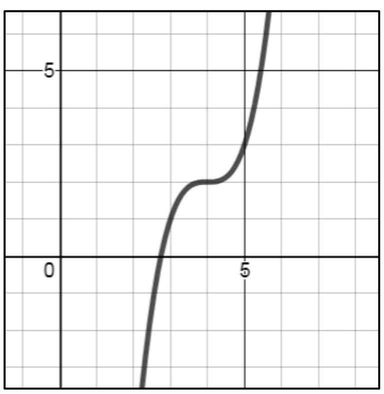
1. _______________ 2. _______________ 3. _______________

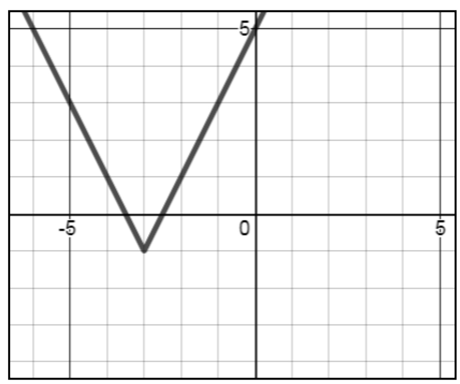
4. How can you tell from the graph if it is even or odd? How can you determine this algebraically?

An even function - ____

An odd function - ____

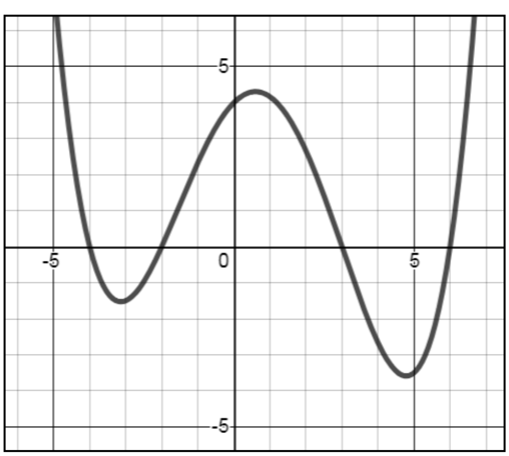
Transformations: write the function of each graph by identifying the parent and the transformations.





5. ___________________________________ 6. ___________________________________

Extrema: Circle the extrema of on the graph of the function, $f(x)$. Then, label each extrema as **a, b,** or **c**. Finally, classify the extrema as **absolute** or **relative**, and **maximum** or **minimum** for the function..



7.

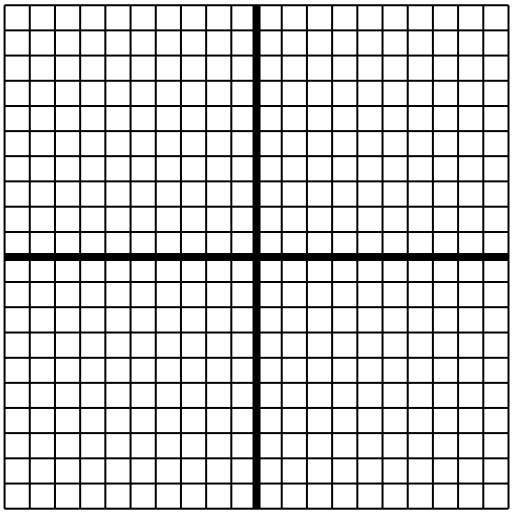
a) ________________________________

b) ________________________________

c) ________________________________

Graph characteristics: for the following functions, graph it, describe the transformations that occur from the parent graph, and idenfity the characteristics:

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



Transformations: ______________________________

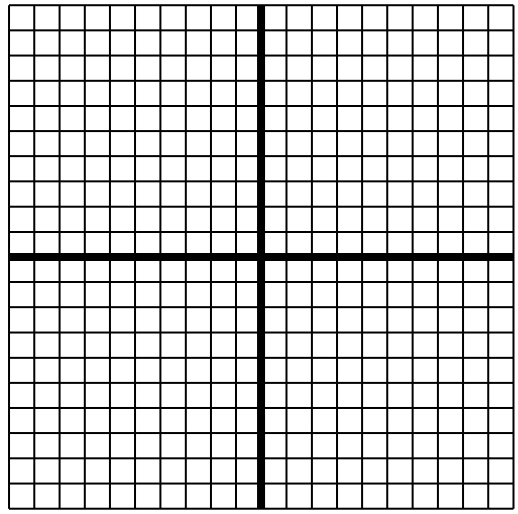
Domain ______________Range _________________

Extrema _____________ Bounded ______________

Increase _____________ Decrease _______________

End Behavior: $\lim_{x \to -\infty} f(x)=$ $\lim_{x \to \infty} f(x)=$

9. $g(x) = 2^{-x} - 3$



Transformations: ______________________________

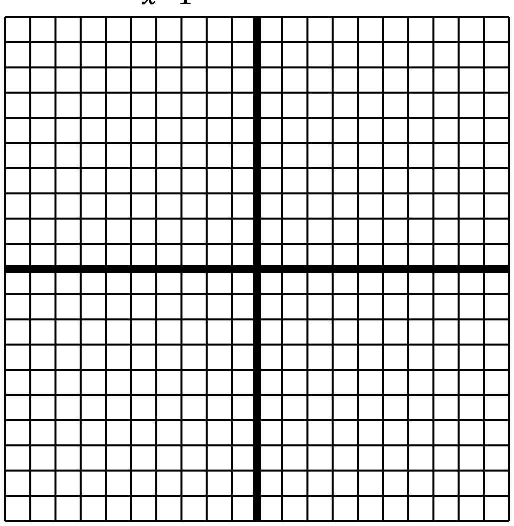
Domain _______________Range ________________

Extrema ______________ Bounded _____________

Increase ______________ Decrease _____________

End Behavior: $\lim_{x \to -\infty} f(x)=$ $\lim_{x \to \infty} f(x)=$

10. $h(x) = \frac{2}{x-1}$

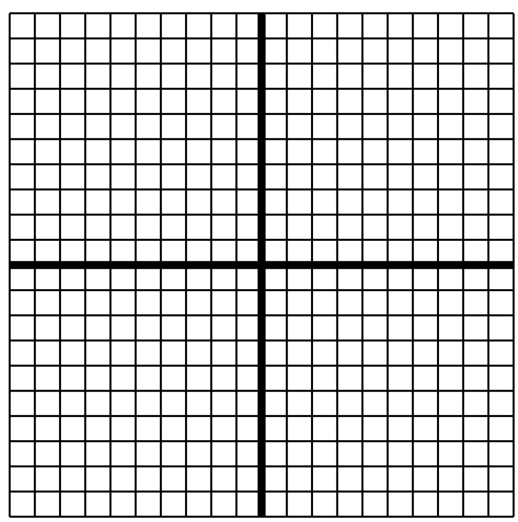


Domain _______________Range _______________

Continuous? ____________________

Asymptotes: VA __________ HA ________

11. $k(x) = (x-3)^3 - 1$



Domain _______________Range _______________

Continuous? ___________________

Bounded? ___________________

End Behavior: $\lim_{x \to -\infty} f(x)=$ $\lim_{x \to \infty} f(x)=$ End Behavior: $\lim_{x \to -\infty} f(x)=$ $\lim_{x \to \infty} f(x)=$

Asymptotes: state the vertical and/or horizontal asymptotes for the graphs of each function.

12. $f(x) = \frac{5x}{3x-6}$

VA: ___________

HA: ___________

13. $g(x) = \log_2(x+1)$

VA: ___________

HA: ___________

14. $h(x) = e^x + 3$

VA: ___________

HA: ___________

Function Combination & Composition: given f(x) = $x^2 - 1$ and g(x) = 3 – x, find each. Then state the domain of the resulting function.

15. f – g

____

Domain: ____________

16. f/g

____

Domain: ____________

17. f * g

____

Domain: ____________

18. f (g(x))

____

Domain: ____________

Given f(x) = $\sqrt{x-4}$ and g(x) = $x^2 - 5$, find each. State the domain of the resulting function for #19 and #21.

19. f (g(x))

____

Domain: ____________

20. f (g(5))

____

21. g (f(x))

____

Domain: ____________

22. g (f(1))

____

Given h(x), find f(x) and g(x) such that h(x) = f (g(x)). Hint: Look for the function on the "inside", that's g(x)!

23. h(x) = $(x + 1)^3 - 4$

f(x) = ___________________

g(x) = ___________________

24. h(x) = 5^{3x}

f(x) = ___________________

g(x) = ___________________

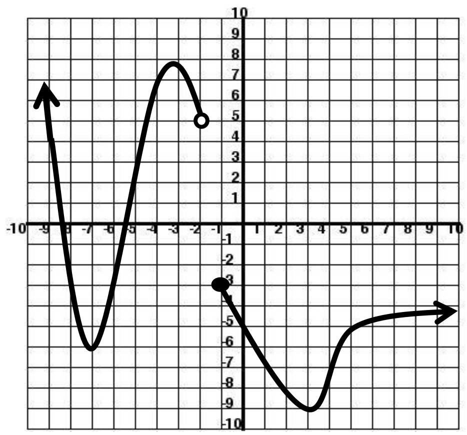
25. h(x) = | x – 3 | + 1

f(x) = ___________________

g(x) = ___________________

Piecewise functions: be able to graph, write the function from the graph, and identify the characteristics.

26. Analyze the following graph of a piecewise function.



Domain: ______________________ Range: ______________________

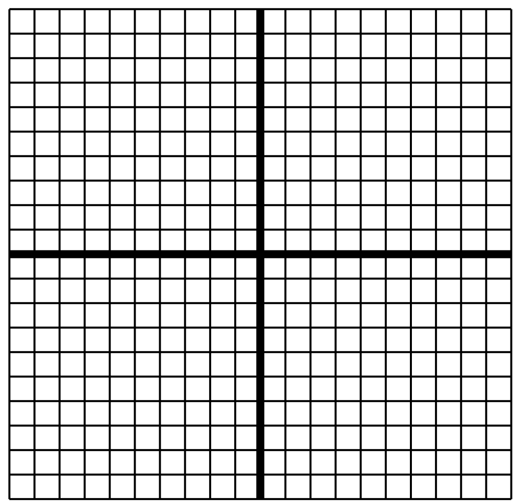
Increase ______________________ Decrease: ____________________

Extrema: ____

Bounded? ______________ Continuous? ____________________

End Behavior: $\lim_{x \to -\infty} f(x) =$ $\lim_{x \to \infty} f(x) =$

27. Graph: $g(x) = \begin{cases} x+3 & if \quad x \le -2 \\ -3 & if \quad -2 < x \le 5 \\ 8-2x & if \quad 5 < x \le 8 \end{cases}$



28. Write the function graphed in 3 pieces:

$h(x) = \Bigg\{$