Honors CCM2 Unit 6 Name: ____________

Graphing Advanced Functions

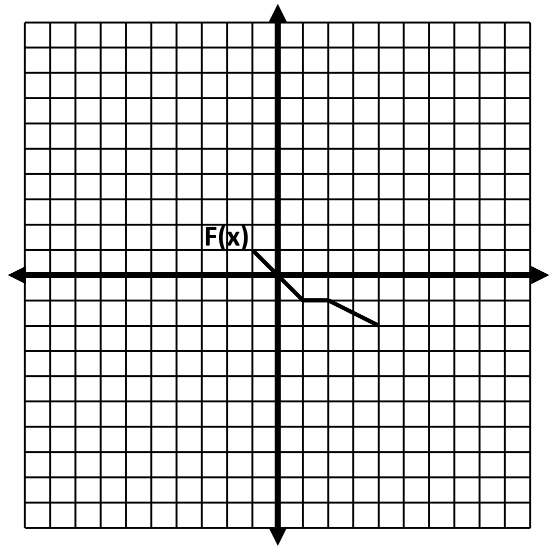
This unit will get into the graphs of simple rational (inverse variation), radical (square and cube root), piecewise, step, and absolute value functions. You should continue with using transformations to help you graph from a parent function. We will use function notation throughout and use it to model and evaluate simple power functions and inverse variation. The unit will also dig into how we solve simple rational (inverse variation) and radical (square root and cube root) equations and introduce the idea of extraneous solutions. We will also look into solving systems of equations with linear and inverse variations.

In this unit, students will . . .

- Graph a function and its translation. (**F-BF.3)**
- Identify how the graph of a function has changed from its parent function. (Honors: discuss the order of transformations given that multiples can occur in a function. (**F-BF.3)**
- Use function notation. (**F-IF.2)**
- Analyze a function and its graph based on its key features. (Honors: Range and asymptotes are discussed and change with translations) (**F-IF.4)**
- Solve simple rational equation (Honors: extend to rationals with linear and factorable quadratic terms) (**A-REI.2)**
- Solve radical equations (**A-REI.2)**
- Model situations using inverse variation (**F-BF.1)**
- Explain why a solution is extraneous and give examples of extraneous solutions (**A-REI.2)**
- Create equations and inequalities in one variable (**A-CED.1)**
- Use equations and inequalities to solve problems. **(A-REI.2)**
- Represent constraints by equations or inequalities. (**A-CED.3)**

Day	Activity
Monday, 4/18	Domain & Range Pictionary Start Fred Functions
Tuesday, 4/19	Finish Fred Functions Quadratic&Absolute Value Transformations
Wednesday, 4/20	Graphing 2^x and log(x)
Thursday, 4/21	Graphing Square and Cube Root
Friday, 4/22	Review & Quiz
Monday, 4/25	Graphing Inverse Variation
Tuesday, 4/26	Graphing Step Functions
Wednesday, 4/27	Graphing Piecewise Functions Intro
Thursday, 4/28	Review & Quiz
Friday, 4/29	Graphing Piecewise Practice & Review
Monday, 5/2	Unit 6 Test

To the right is a graph of a "piece-wise" function. We'll call this function **F(x)**. We can use **F(x)** to explore transformations in the coordinate plane.



1. How do we know that **F(x)** is a function? *(Hint: How do we define a function?)*

2. What is the domain of **F(x)?**

3. What is the range of **F(x)?**

Let's explore the points on F(x).

4. How many points lie on **F(x)**? Can we list them all?

5. What are the key points that would help us graph **F(x)**?

   We are will call these key points ***"characteristic" points****. It is important when graphing a function that you are able to identify these characteristic points.*

6. Use the graph of **F(x)** to evaluate the following:

   F(1) = _______ F(−1) = _______ F(5) = _______

Remember that F(x) is another name for the y-values

7. Fill the three tables using the graph of **F(x)**.

x	F(x)
−1	
1	
2	
4	

x	F(x) + 4
−1	
1	
2	
4	

x	F(x) – 3
−1	
1	
2	
4	

8. Graph **F(x) + 4** and **F(x) – 3** in different colors on the coordinate plane above

   (Use the coordinate plane above)

9. In **y = F(x) + 4**, how did the "+4" affect the graph of **F(x)**? What type of *transformation* maps **F(x)** to **F(x) + 4**? (Be specific)

10. In **y = F(x) – 3**, how did the "–3" affect the graph of **F(x)**? What type of *transformation* maps **F(x)** to **F(x) – 3**? (Be specific)

11. Fill the three tables using the graph of **F(x).**

x	F(x)
−1	
1	
2	
4	

x	x + 4	y = F(x + 4)
-5	−1	1
	1	-1
	2	-1
	4	-2

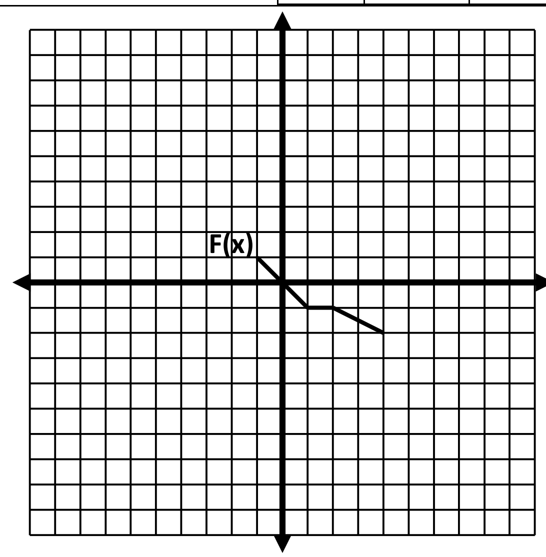
***Hint**: In the first box we have x + 4 = -1. If we subtract 4 from both sides of the equation, we get x = -5. Use a similar method to find the remaining x values.*

x	(x – 3)	y = F(x – 3)
	−1	1
	1	-1
	2	-1
	4	-2

12. On the coordinate plane to the right:

a. Use one color to graph the 4 ordered pairs (x, y) for **y = F(x + 4).** The first point is (-5, 1).

b. Use a different color to graph the 4 ordered pairs (x, y) for **y = F(x - 3**).



13. In **y = F(x+4),** how did the "+4" affect the graph of **F(x)**? What type of *transformation* maps **F(x)** to **F(x + 4)**? (Be specific)

14. In **y = F(x – 3),** how did the "–3" affect the graph of **F(x)**? What type of *transformation* maps **F(x)** to **F(x – 3**)? (Be specific)

15. Fill the tables using the graph of **F(x).**

x	F(x)
−1	
1	
2	
4	

x	-F(x)
−1	
1	
2	
4	

x	2F(x)
−1	
1	
2	
4	

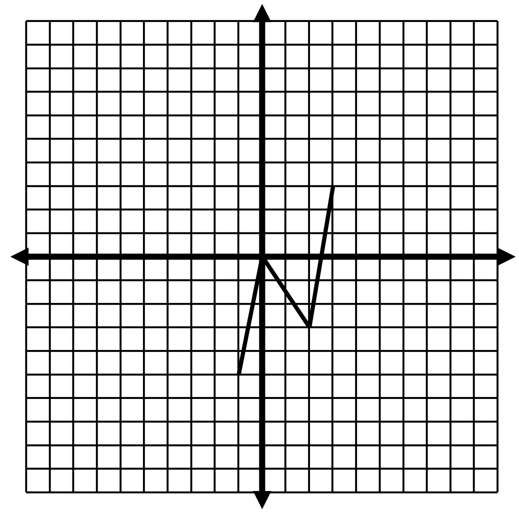
x	½F(x)
−1	
1	
2	
4	

16. How did each of the following affect the graph of **F(x)**: a) the "-" sign b) the "2" c) the "½"	*Hint: Use one of the coordinate planes above if needed.* a) b) c)

Summary: Describe the effect to F(x) for the following functions.

Equation	Effect on the graph of F(x)
Example: y=F(x + 18)	Translate **F(x)** to the left 18 units
1. y = F(x) – 100	
2. y = F(x - 48)	
3. y = F(x) + 32	
4. y = -F(x)	
5. y = F(x – 10)	
6. y = F(x) + 7	
7. y = ¼F(-x)	
8. y = F(x) – 521	
9. y = F(x) + 73	
10. y = -5F(x)	
11. y = F(x) – 22	
12. y = 2F(x – 13)	
13. y = F(x + 30) + 18	
14. y = -¼F($\frac{1}{3}$x) -27	

To the right is a graph of a "piece-wise" function that we'll call **H(x)**.



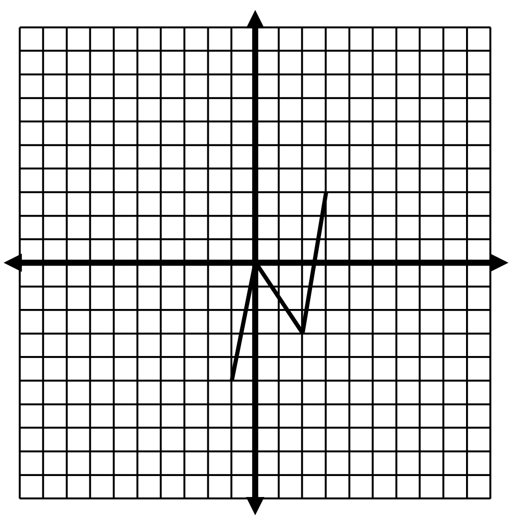
Use **H(x)** to demonstrate what you have learned so far about the transformations of functions.

1. What are the characteristic points of **H(x)**?

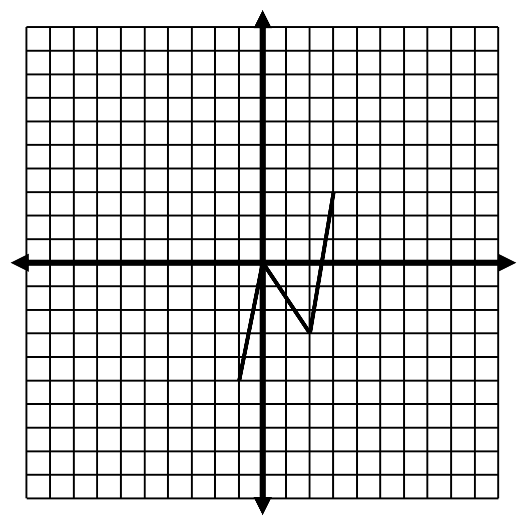
____

2. Describe the effect on the graph of H(x) for each of the following:
   a. H(x – 2) ___________________________
   b. H(x) + 7 ___________________________
   c. H(x+2) – 3 ___________________________
   d. -2H(x) ___________________________
3. Use your answers to questions 1 and 2 to help you sketch each graph ***without using a table***.

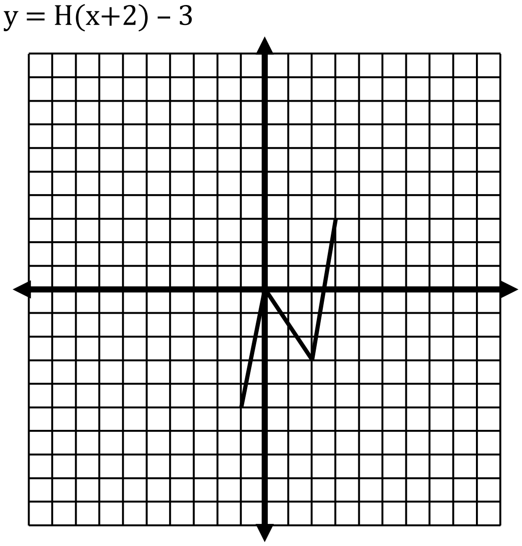
a. y = H(x – 2)



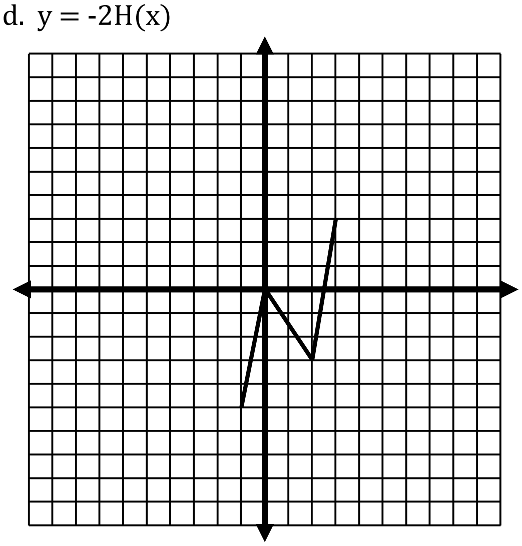
b. y = H(x) + 7



c. y = H(x+2) – 3



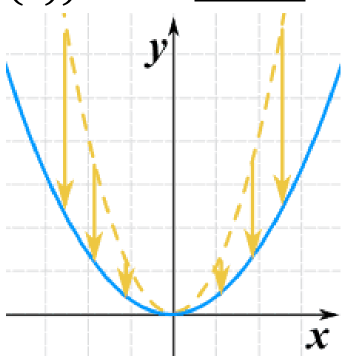
d. y = -2H(x)



Graphing Quadratic Functions

- A quadratic graph is in a U shape called a _______________________
- Quadratic graphs follow the same rules as "Fred"
- Quadratic functions have a _________________ that can be found by identifying the ______________________ and _________________________ transformations.
- Quadratic functions that have been transformed are in the form:

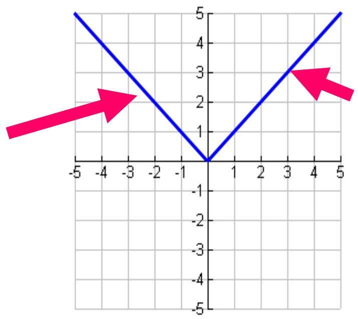
- ❖ F(x) + c moves the parent graph _____ c units
- ❖ F(x) - c moves the parent graph _____ c units
- ❖ F(x + c) moves the parent graph _____ c units
- ❖ F(x – c) moves the parent graph _____ c units
- ❖ -(f(x)) _______ the parent graph ____________________ (over the ____________________________________)
- ❖ f(-x) _______ the parent graph ____________________ (over the ____________________________________)
- ❖ a(f(x)) _______ or ________ the parent graph



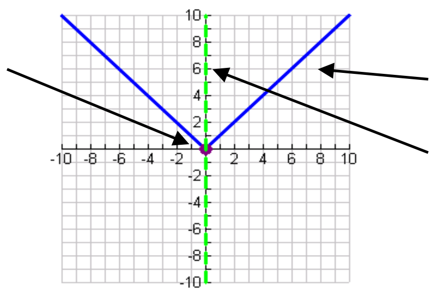
- If |a| > 1, then the graph _______
- If 0 < |a| < 1, then the graph _________

Graphing Absolute Value Functions

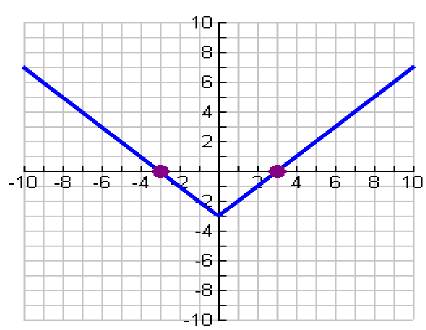
- The function f(x) = |x| is an ___________________________________.
- The graph of this piecewise function consists of 2 rays, is v-shaped, and opens up.



- The highest or lowest point on the graph of an absolute value function is called the ___________.
- An ___________ of the graph of a function is a vertical line that divides the graph into mirror images.
    - **An absolute value graph has _______ axis of symmetry that passes through the ______.**

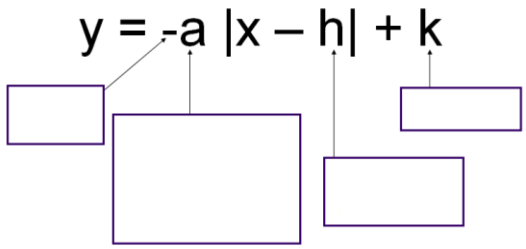


- The __________ of a function f(x) are the values of x that make the value of f(x) zero.
- On this graph where ___________ and _________ are where the function would equal 0.



f(x) = |x| - 3

- A ________________ changes a graph's size, shape, position, or orientation.
- A _________________________ is a transformation that shifts a graph horizontally and/or vertically, but does not change its size, shape, or orientation.
- A _____________________ is when a graph is flipped over a line. A graph flips __________________ when -1· f(x) and it flips ____________________ when f(-1x).
- A ___________________ changes the size of a graph by stretching or compressing it. This happens when you ____________________ the function by a number.



Remember that (h, k) is your vertex

- **Example 1**: Identify the transformations:

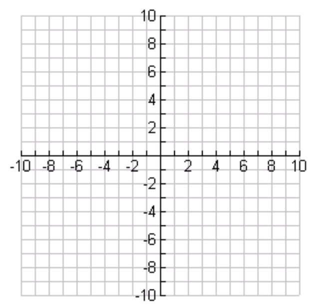
  1. $y = 3\,|x + 2| - 3$

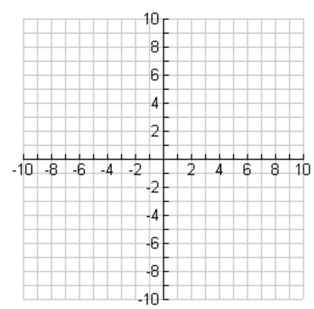
  2. $y = |x - 1| + 2$

  3. $y = 2\,|x + 3| - 1$

  4. $y = -1/3|x - 2| + 1$

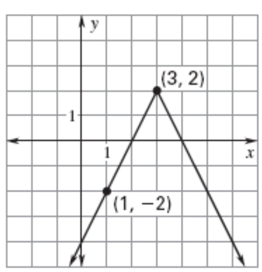
- **Example 2:** Graph $y = -2\,|x + 3| + 2$.
  - What is your vertex?
  - What are the intercepts?
  - What are the zeros?



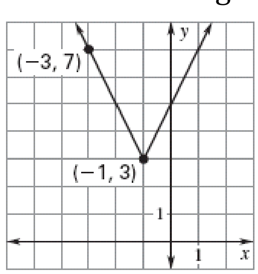


- **You Try:** Graph $y = -1/2\,|x - 1| - 2$
  - Compare the graph with the graph of $y = |x|$ (what are the transformations)

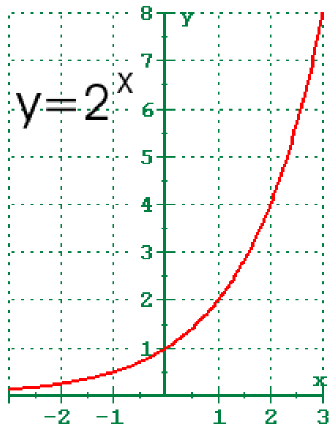
- **Example 3**: Write a function for the graph shown.

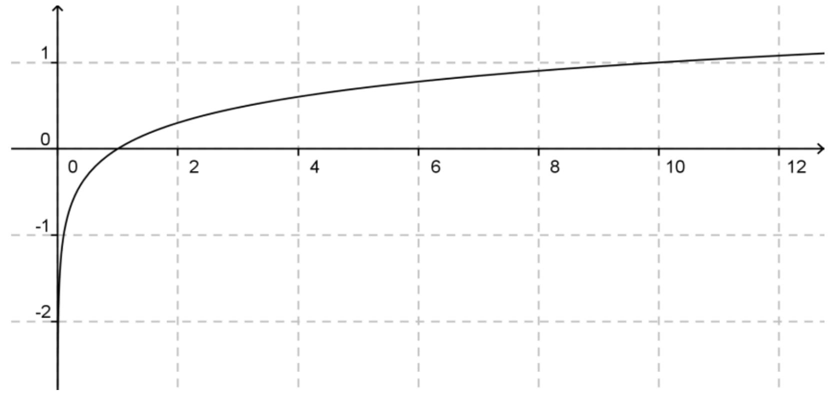


- **You Try**: Write a function for the graph shown.



raphs and Exponential Graphs





*Note: ________________ and _______________ are the same graph

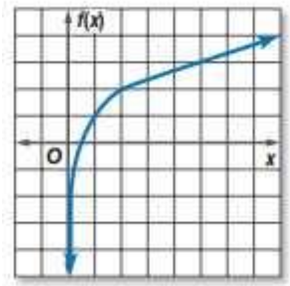
Define Asymptote:

Key Features of Exponential and Logarithmic Functions		
Characteristic	Exponential Function $y = 2^x$	Logarithmic Function $y = \log x$
Asymptote		
Domain		
Range		
Intercept		

Translations of logarithmic functions are very similar to those for other functions and are summarized in the table below.

Parent Function	**y = logx**	**Y=2^x**
Shift up		
Shift down		
Shift left		
Shift right		
Combination Shift		
Reflect over the x-axis		
Stretch vertically		
Stretch horizontally		

Let’s look at the following example.



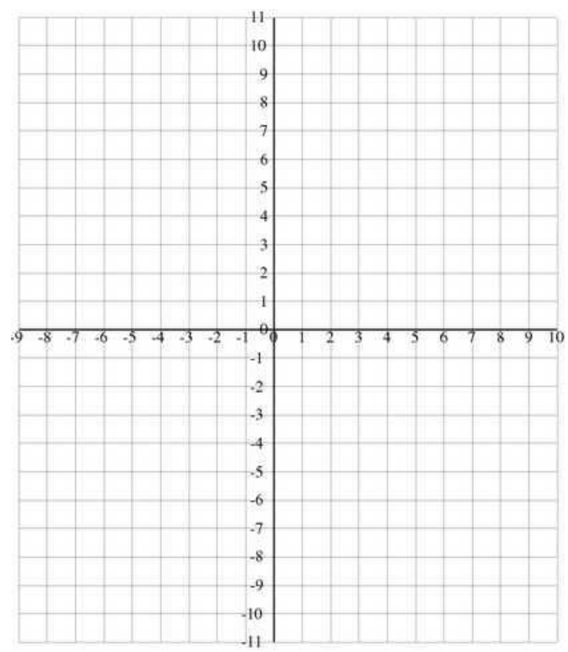
The graph on the right represents a transformation of the graph of $f(x) = 3 \log_{10} x + 1$.

- $|x| = 3$: __________________________.
- $h = 0$: __________________________.
- $k = 1$: __________________________.

Domain: Range: Asymptote:

TRY NOW

Graph the following function on the graph at right. Describe each transformation, give the domain and range, and identify any asymptotes.



$y = -2\log_{10}(x + 2) – 4$

Domain:

Range:

Asymptote:

Description of transformations:

Guided Practice with Logarithmic Functions

Graph the following transformations of the function $y = \log_{10} x$ on the coordinate planes. Determine the domain, range, and asymptotes of each transformation. Describe the transformations.

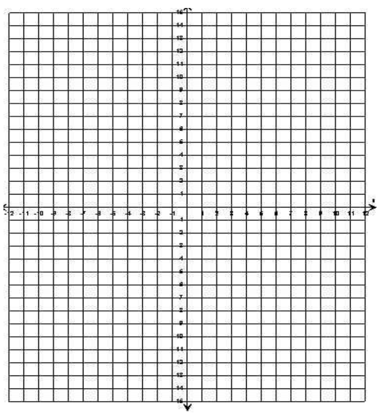
1) $y = \log_{10} x - 6$

Domain:

Range:

Asymptotes:

Description:



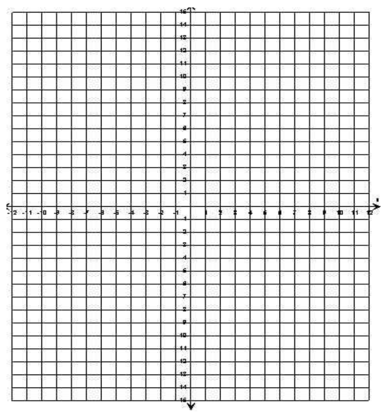
2) $y = -\log_{10} (x + 2)$

Domain:

Range:

Asymptotes:

Description:



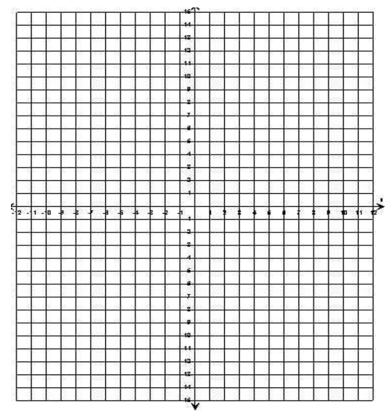
3) $y = \log_{10} 2x$

Domain:

Range:

Asymptotes:

Description:



Graph the following transformations of the function $y = 2^x$ on the coordinate planes. Determine the domain, range, and asymptotes of each transformation. Describe the transformations.

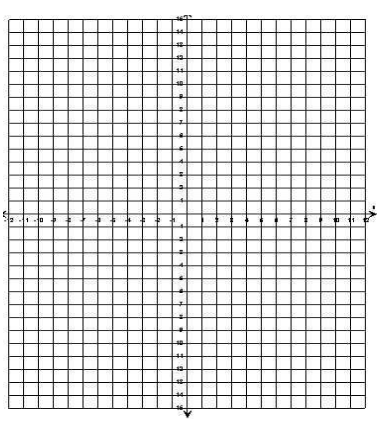
4) $f(x) = 2^{x+1} - 3$

Domain:

Range:

Asymptotes:

Description:



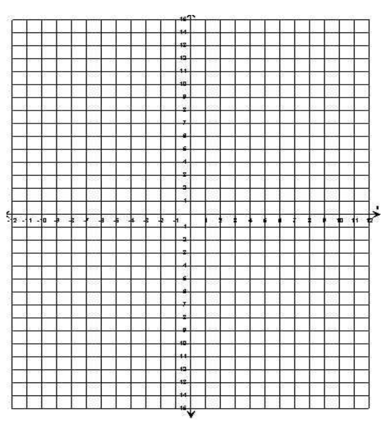
5) $f(x) = -2^x - 1$

Domain:

Range:

Asymptotes:

Description:



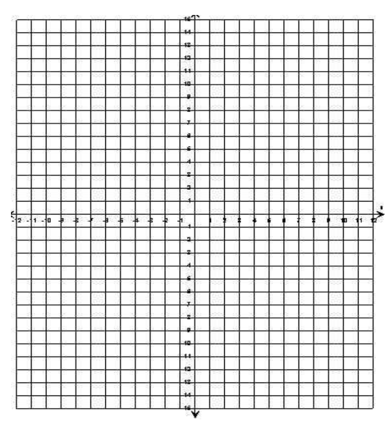
6) $f(x) = 2^{x-5} + 2$

Domain:

Range:

Asymptotes:

Description:



7) State the domain, range, intercepts and asymptotes of $f(x) = \log(x - 2) + 3$.

8) Describe the transformations of $y = 4 \log (2x - 4) + 6$ from the parent function $y = \log(x)$.

9) Describe the transformations of $y = -3 \log_{10} (4x + 3) - 2$ from the parent function $y = \log_{10} (x)$.

Graphing Square and Cube Root Functions

Make a table for each function.

$f(x) = x^2$

x	f(x)
0	
1	
2	
3	
4	

$f(x) = \sqrt{x}$

x	f(x)
0	
1	
4	
9	

$f(x) = x^3$

x	f(x)
-2	
-1	
0	
1	
2	

$f(x) = \sqrt[3]{x}$

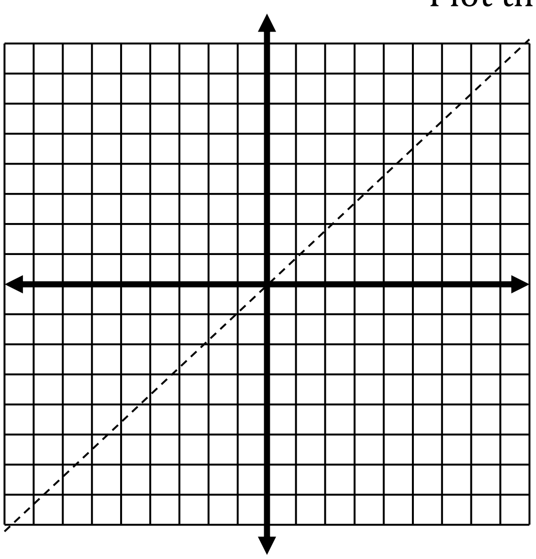
x	f(x)
-8	
-1	
0	
1	
8	

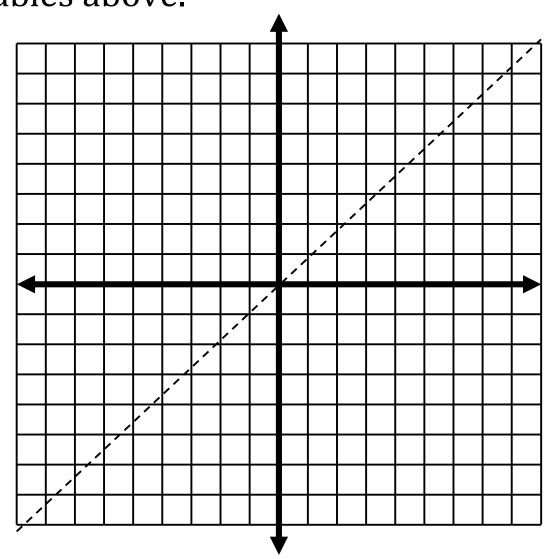
Ignore the points with decimals. What do you notice about the other points?

____

These functions are ______________ of each other. By definition, this means the ____________ and the ____________ ____________.

Plot the points from the tables above.



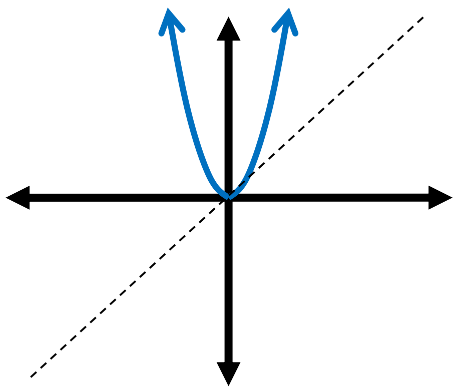


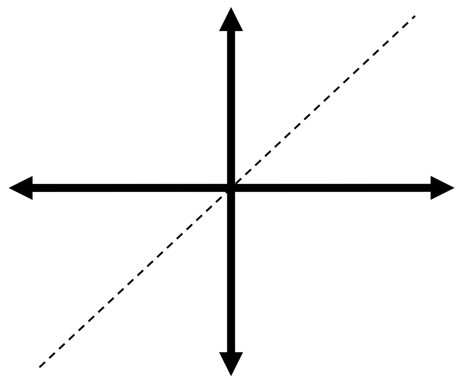
As a result, the graphs have the same numbers in their points but the ____ and the ________ coordinates have __________ ______________.

This causes the graphs to have the ____________ ______________ but to be ________________ over the line __________.

The Square and Square Root Function

Reflect the function $f(x) = x^2$ over the line $y = x$.

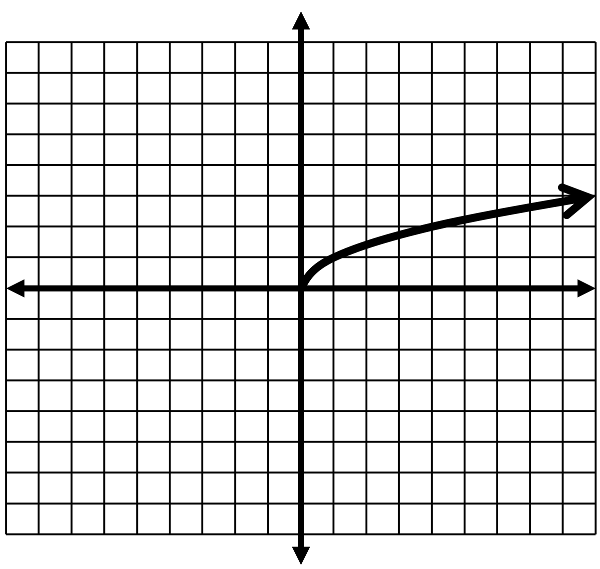




Problems? _______________

We have to define the Square Root ____________ as ______________. This means that we will only use the _______________ side of the graph.

The result: $f(x) = \sqrt{x}$



Characteristics of the graph

Vertex

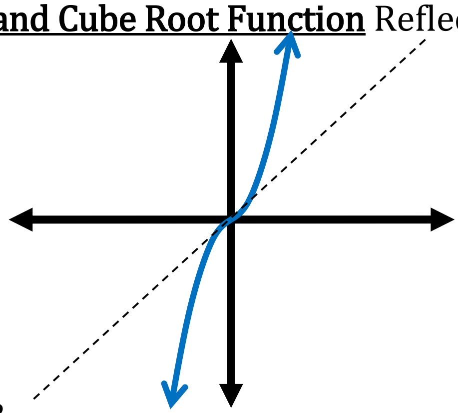
Domain

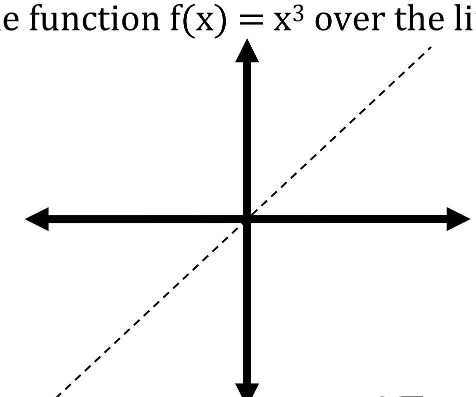
Range

Symmetry

Pattern

The Cube and Cube Root Function Reflect the function $f(x) = x^3$ over the line $y = x$.

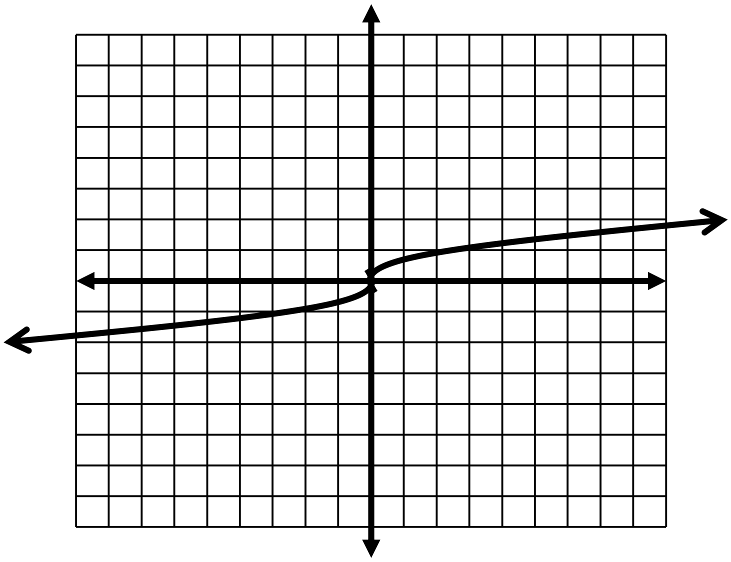




Problems? _______________

The result: $f(x) = \sqrt[3]{x}$

Characteristics of the graph



Vertex

Domain

Range

Symmetry

Pattern

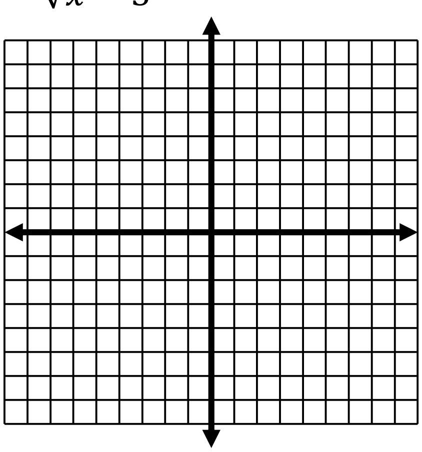
Transforming the Graphs

Now that we know the shapes we can use what we know about transformations to put that shape on the coordinate plane.

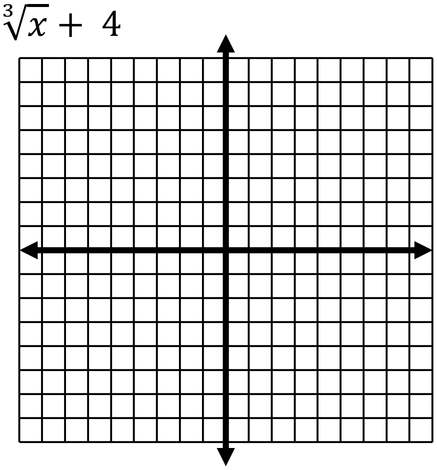
Remember:

Translate | Reflect | Dilate

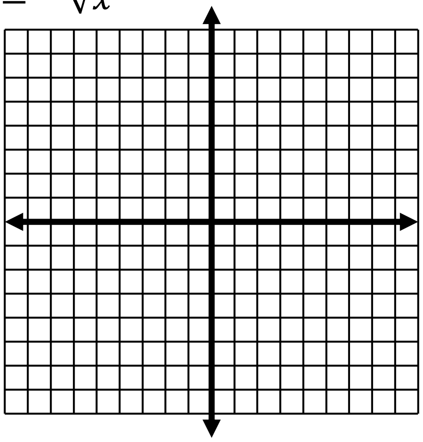
1) $f(x) = \sqrt{x - 3}$



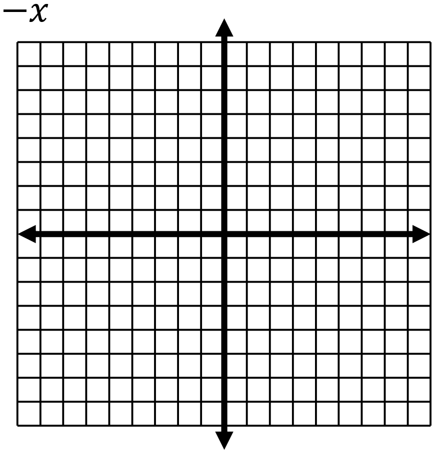
2) $f(x) = \sqrt[3]{x} + 4$



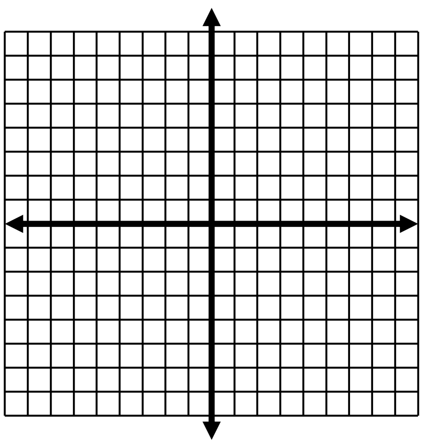
3) $f(x) = -\sqrt[3]{x}$



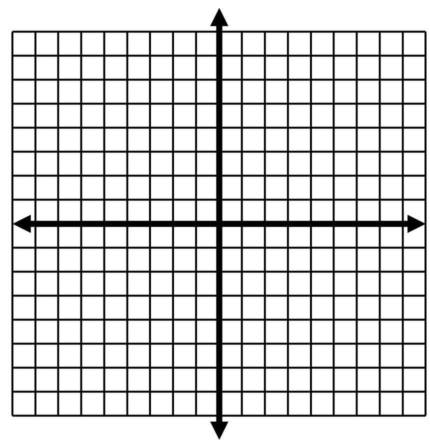
4) $f(x) = \sqrt{-x}$



5) $f(x) = 2\sqrt[3]{x+3}$



6) $f(x) = \frac{1}{2}\sqrt{x}$



Sometimes the functions are not in graphing form. We may have to use some of our algebra skills to transform the equations into something we can use.

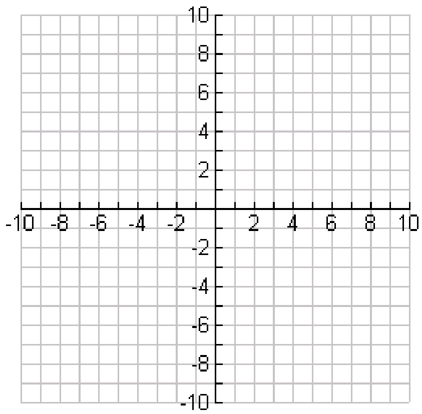
Ex: $f(x) = \sqrt{4x - 12}$ **This is not in graphing form.**

Ex: $f(x) = \sqrt[3]{8x + 32} - 5$ **This is not in graphing form.**

Graphing Radical Functions Practice

Graph each function, and identify its domain and range. For 5-6 put in graphing form first.

1. $f(x) = 2\sqrt{x+1} - 3$

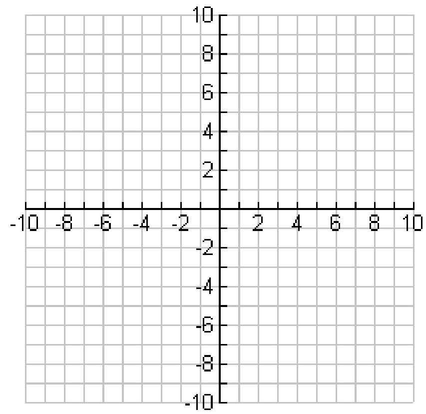


Transformation:

Domain:

Range:

2. $f(x) = \sqrt[3]{x} + 4$

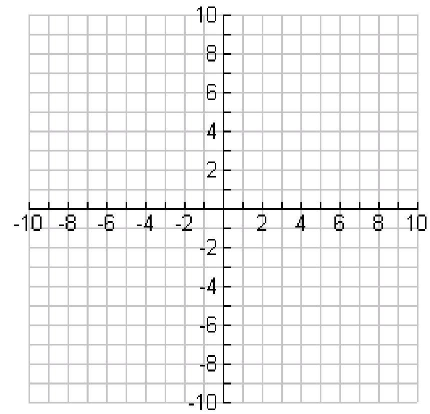


Transformation:

Domain:

Range:

3. $f(x) = -\frac{1}{2}\sqrt[3]{x-3}$

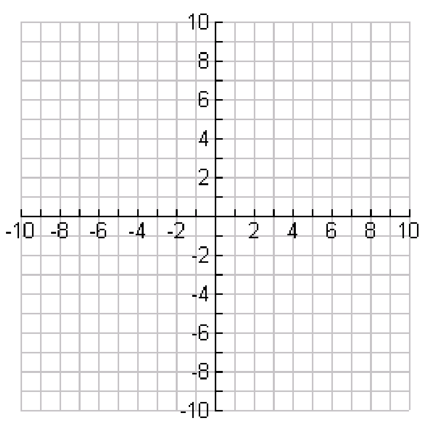


Transformation:

Domain:

Range:

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

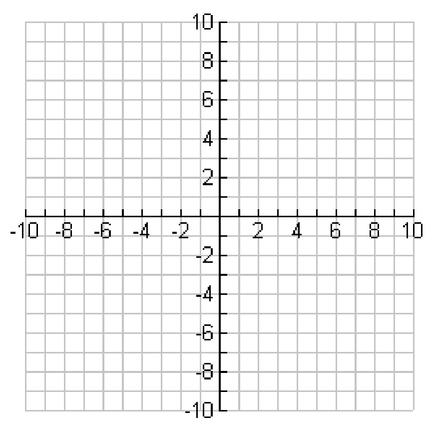


Transformation:

Domain:

Range:

5. $f(x) = \sqrt[3]{8x + 16} - 3$



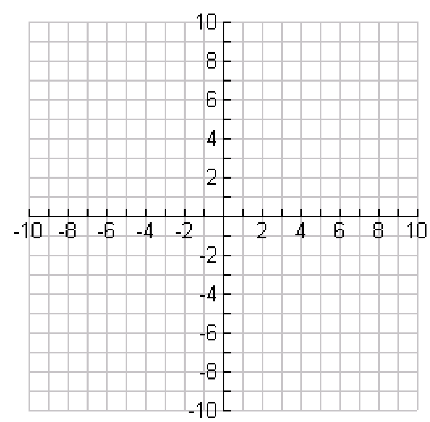
Graphing Form:

Transformation:

Domain:

Range:

6. $f(x) = \sqrt{9x - 27} - 2$



Graphing Form:

Transformation:

Domain:

Range:

Graphing Inverse Variation

A relationship that can be written in the form $y = \frac{k}{x}$, where k is a nonzero constant and $x \neq 0$, is an ____________________________.

The constant k is the ____________________________.

Inverse variation implies that one quantity will ____________ while the other quantity will ______________ (the inverse, or opposite, of increase).

The domain is all real numbers _______________.

Why?

The range is all real numbers _______________.

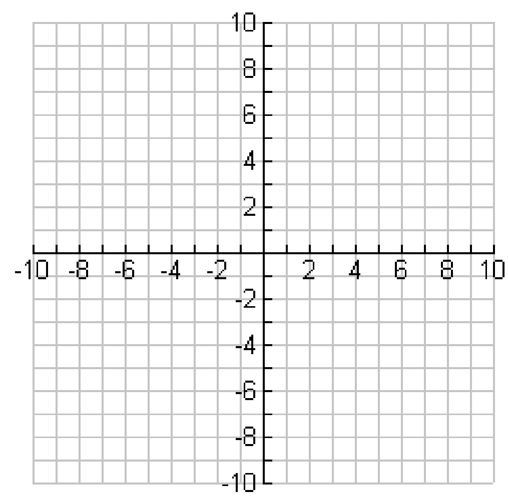
Why?

Since both the domain and range have restrictions at zero, the graph can never touch the x and y axis.

This creates asymptotes ___________________.

The graphs of inverse variations have two parts.

Ex: $f(x) = \frac{1}{x}$



Each part is called a _____________.

When k is ____________, the branches are in Quadrants _____ and _____.

When k is ____________, the branches are in Quadrants _____ and ______.

Translations of Inverse Variations:

The graph of y=________________

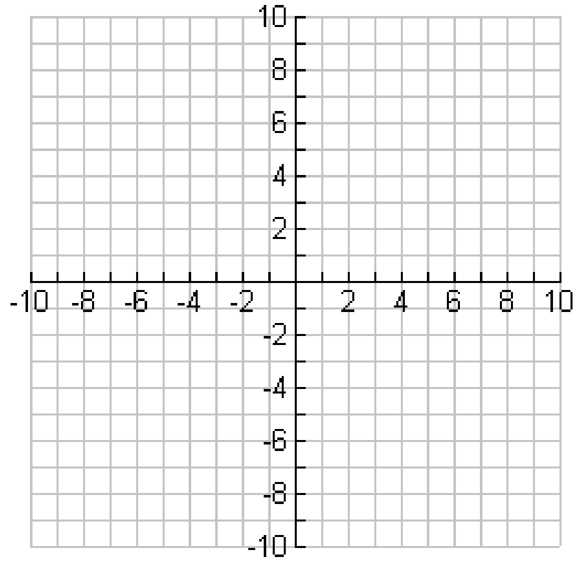
is a translation of _________, b units _________ and c units ____________.

The vertical asymptote is ____________. The horizontal asymptote is ___________.

k tells us how far the branches have been _______________ from the ________________. We can use it to help us find out _________________ points to start our __________________.

$\sqrt{k}$ is the distance from the _________________.

Example 1: $y = \frac{1}{x-3} + 4$



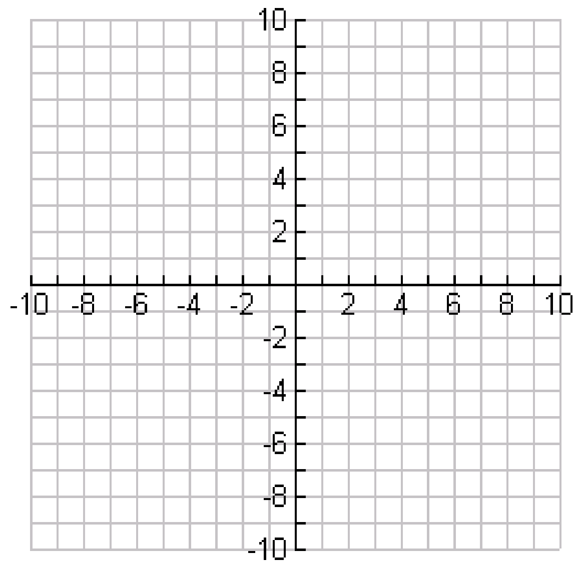
Vertical Asymptote:

Horizontal Asymptote:

Quadrants:

Distance from the Asymptote:

You Try: $y = -\frac{4}{x+1}$



Vertical Asymptote:

Horizontal Asymptote:

Quadrants:

Distance from the Asymptote:

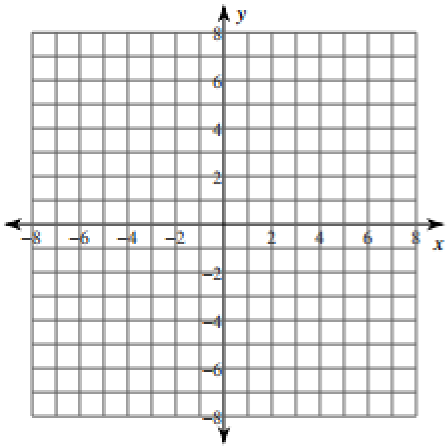
We can also write the equation just given the parent function and the asymptotes.

Example: Write the equation of $y = -\frac{1}{x}$ that has asymptotes x = -4 and y = 5.

Graphing Inverse Variation Practice

For each of the graphs, identify the horizontal and vertical asymptotes, quadrants where it is located and the distance from the asymptotes.

1. $f(x) = \dfrac{3}{x+1} - 2$



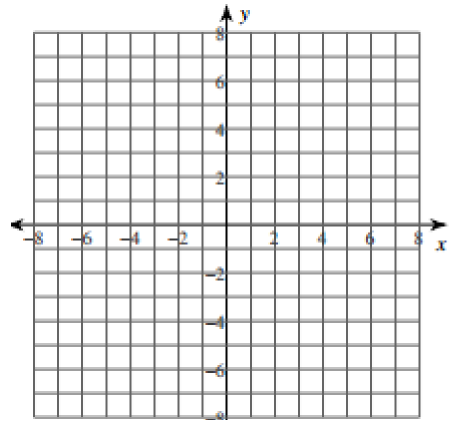
V.A.__________

H.A.__________

Quads_______

Dist._________

2. $f(x) = \dfrac{3}{x+1} + 2$



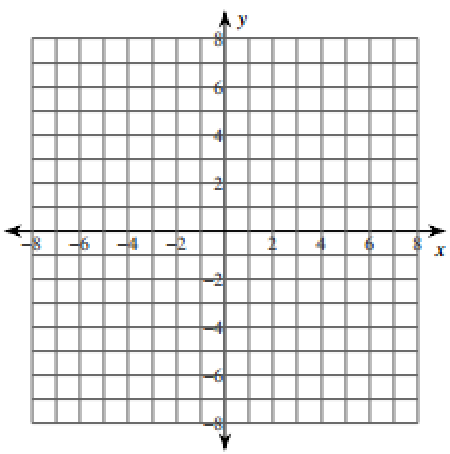
V.A.__________

H.A.__________

Quads_______

Dist._________

3. $f(x) = \dfrac{3}{x} + 1$



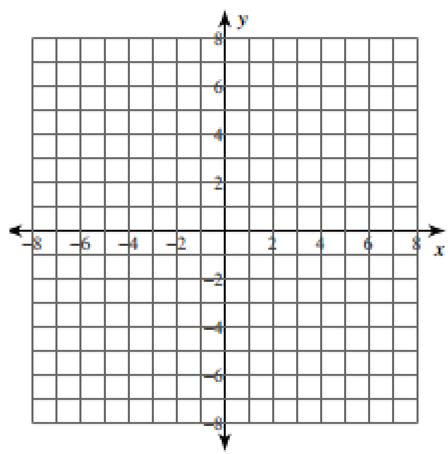
V.A.__________

H.A.__________

Quads_______

Dist._________

4. $f(x) = \dfrac{2}{x-3} + 1$



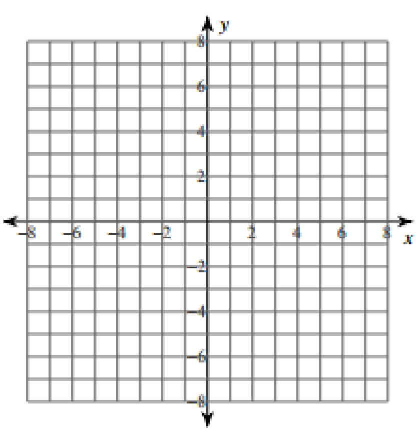
V.A.__________

H.A.__________

Quads_______

Dist._________

5. $f(x) = -\dfrac{4}{x+1} + 1$



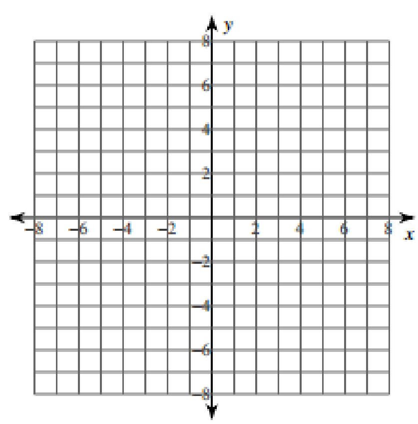
V.A.__________

H.A.__________

Quads_______

Dist._________

6. $f(x) = \dfrac{4}{x} + 2$



V.A.__________

H.A.__________

Quads_______

Dist._________

7. Write the equation of $y = -\frac{1}{x}$ that has asymptotes x = 2 and y = 4 that is 3 units from the asymptotes.

Greatest Integer Function

The Greatest Integer Function ______________________________

$f(x) =$ __________

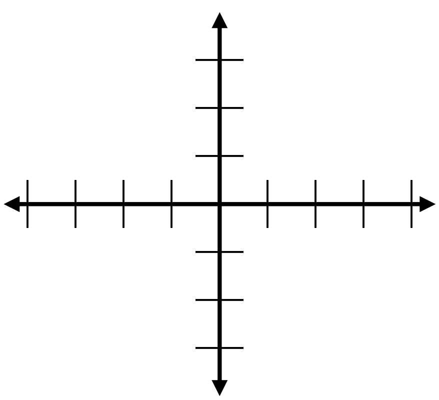
This function takes the input and finds the ______________________ closest to that number ______________________.

Examples:	*Answers*	*Examples:*	*Answers:*
1. [7.35] =		3. [-2.5]	
2. $\left[\frac{4}{3}\right] =$		4. $\left[-\frac{10}{5}\right]$	

Graphing the Greatest Integer Function

The greatest integer function got its nickname, ____________________, from its graph.

$f(x) = [x]$



x	$f(x)$
-2.00	
-1.75	
-1.5	
-1.25	
-1.00	
-0.75	
-0.5	
-0.25	
0.00	
0.25	
0.5	
0.75	
1.00	
1.25	
1.5	

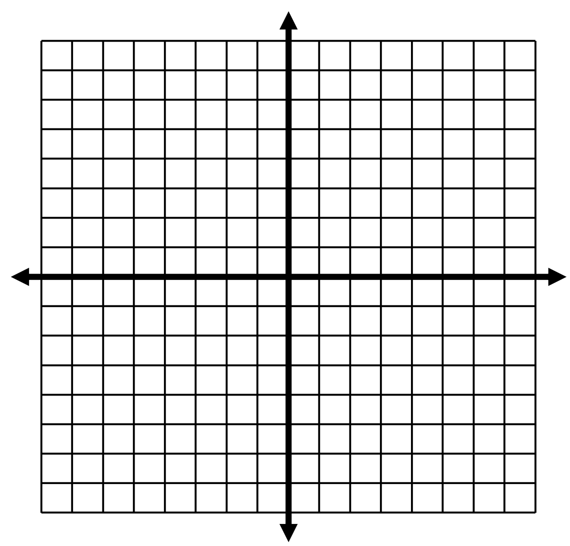
Transformations of the Greatest Integer Function

Don't forget the transformations do not change!

Graphing Form: ______________________________

- ________________ is a starting point for your steps.
- The length of your steps is ____________________.
- The space between your steps (vertically) is _____________.
- If _______ is ________________ the steps go ________________________
- If _______ is ___________________ then the steps _________________________.

Example 1: Graph $f(x) = 2[\![x - 3]\!] + 1$

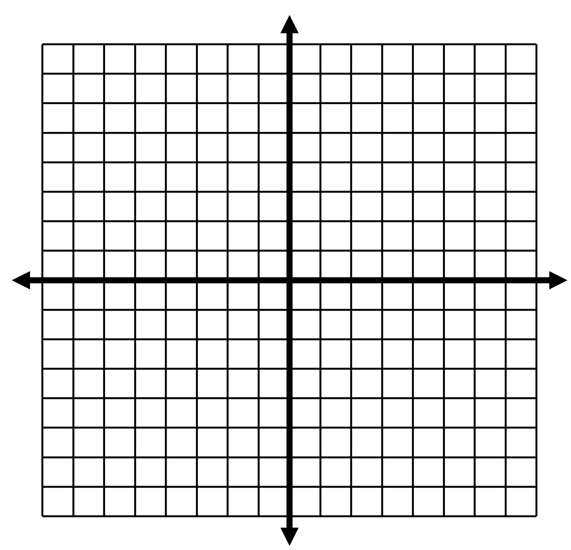


Start ____________

Step length _________

Step height __________

Example 2: Graph $y = [\![2x + 4]\!] - 5$



Get in graphing form! ________________

Start ___________________

Step length ____________

Step height ______________

$[\![x]\!]$ is the Greatest Integer Function. It is the largest integers less than or equal to x.

Evaluate the following:

1. $[\![7.1]\!]$

2. $[\![1.8]\!]$

3. $[\![\pi]\!]$

4. $[\![-6.8]\!]$

5. $[\![-2.1]\!]$

6. $[\![0]\!]$

7. $[\![5.28]\!]$

8. $[\![\frac{8}{3}]\!]$

9. $[\![0.25]\!]$

10. $[\![-0.25]\!]$

11. $3[\![0.75]\!]$

12. $-5[\![-2.5]\!]$

13. $[\![2(1.55)]\!]$

14. $2[\![1.55]\!]$

15. $0.5[\![1.5]\!]$

16. $[\![1.25-5]\!]$

17. $[\![5-1.25]\!]$

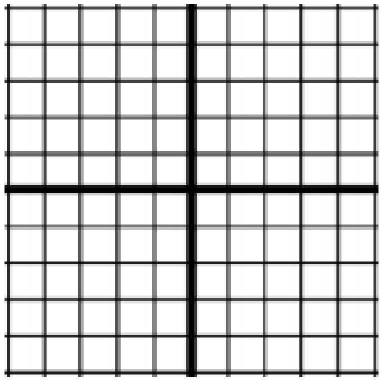
18. $[\![3(1.25)]\!]$

19. $3[\![1.25]\!]$

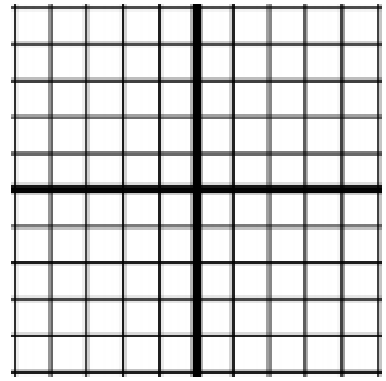
20. $[\![-5]\!]$

Using a table of values, graph each function.

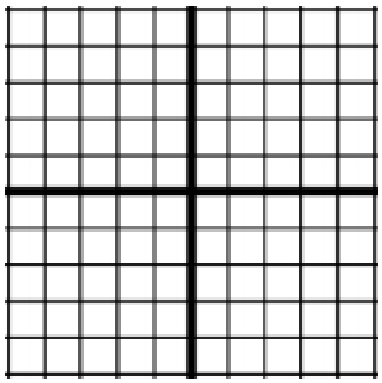
3. $f(x) = [\![x]\!]$



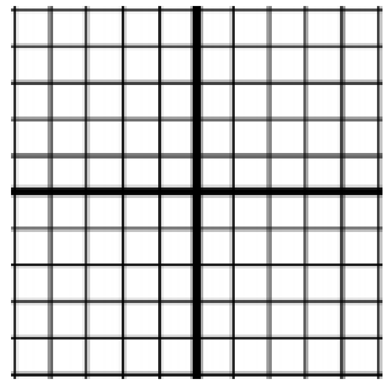
4. $f(x) = [\![x]\!] + 2$



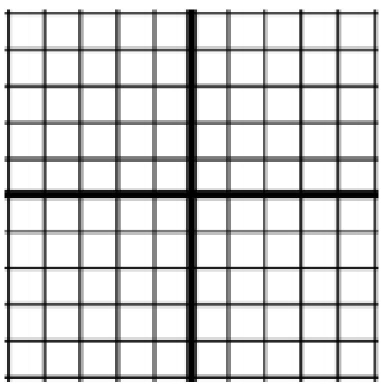
5. $f(x) = [\![x]\!] + 3$



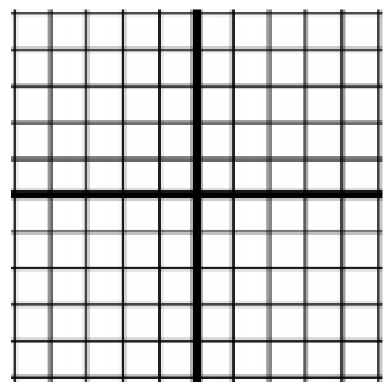
6. $f(x) = 2[\![x]\!]$



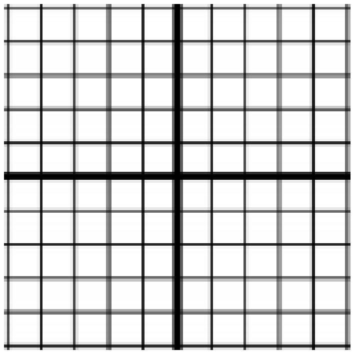
7. $f(x) = [\![x - 3]\!]$



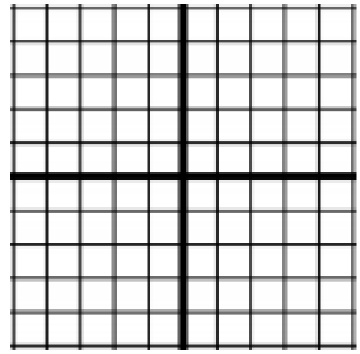
8. $f(x) = [\![-x + 2]\!]$



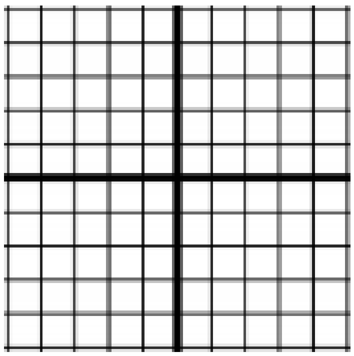
9. $f(x) = -\llbracket x \rrbracket$



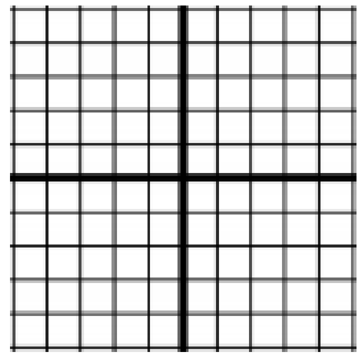
10. $f(x) = \llbracket -x \rrbracket$



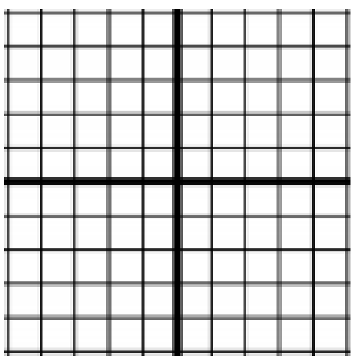
11. $f(x) = -\llbracket x \rrbracket + 3$



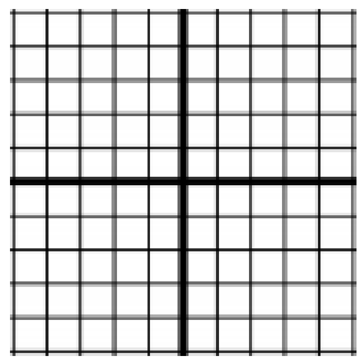
12. $f(x) = \llbracket x + 2 \rrbracket$



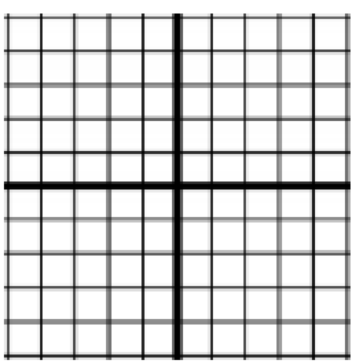
13. $f(x) = 2\llbracket x - 3 \rrbracket$



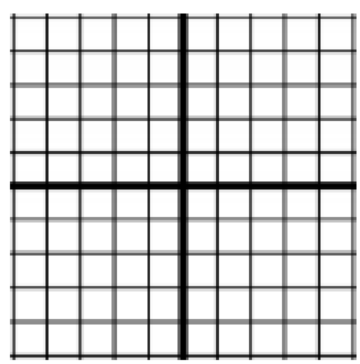
14. $f(x) = -\llbracket x + 2 \rrbracket$



14. $f(x) = \llbracket 2x \rrbracket$



15. $f(x) = \llbracket 2x \rrbracket$-3

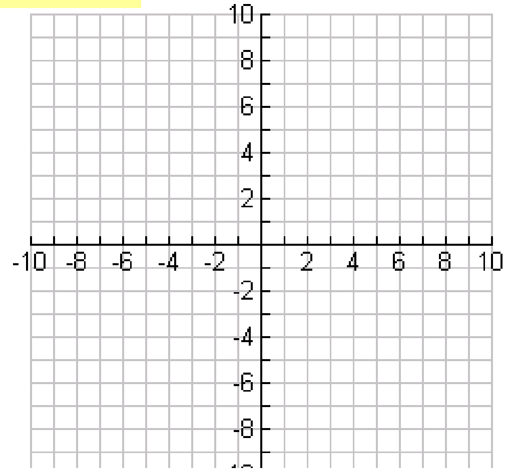


Piecewise Functions

- In real life functions are represented by a combination of equations, each corresponding to a part of the domain.
- These are called ______________________.
- One equation gives the value of f(x) ________________
And the other when ___________

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

Example: Evaluate f(x) when x=0, x=2, x=4 $f(x) = \begin{cases} x+2, if\ \ x < 2 \\ 2x+1, if\ \ x \ge 2 \end{cases}$

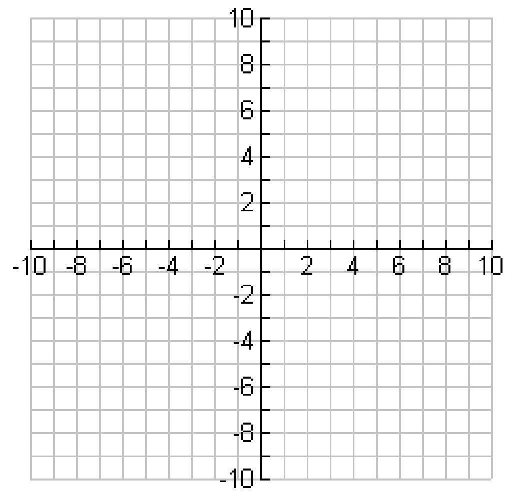


Graph: $f(x) = \begin{cases} \frac{1}{2}x + \frac{3}{2}, if\ \ x < 1 \\ -x+3, if\ \ x \ge 1 \end{cases}$

Make a table for each piece. Be sure to select appropriate x vales.

Use _____________ for < or >

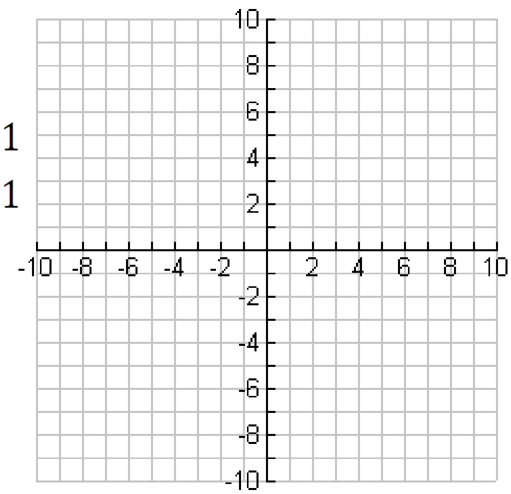
Use _____________ for ≤ or ≥



Graph: $f(x) = \begin{cases} x-1, if\ \ x > 2 \\ -x+1, if\ \ x \le 2 \end{cases}$

Graph:

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



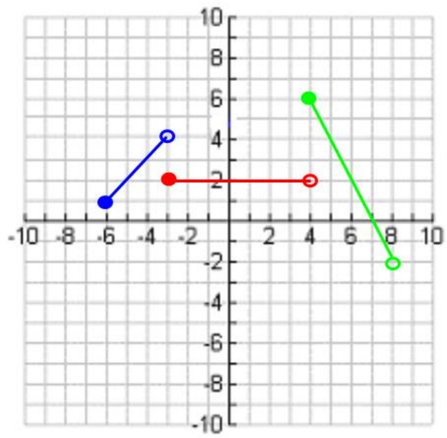
Lesson 2: Writing piecewise functions given a graph.

3. Can you identify the equations of the lines that contain each segment?

   a. Left segment equation=

   b. Middle equation=

   c. Right equation=



4. Next, list the domain of each segment.

   a. Left segment domain=

   b. Middle domain=

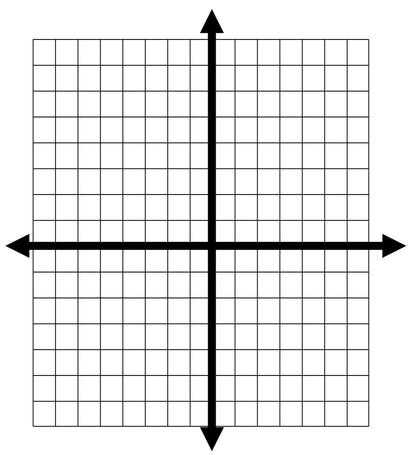
   c. Right domain=

5. Now, put the domain together with the equations to write the piecewise function for the graph.

$f(x) = \{$

Piecewise Functions Practice

1. $f(x) = \begin{cases} x + 5 & x < -2 \\ x^2 + 2x + 3 & x \geq -2 \end{cases}$



$f(3) =$

$f(-4) =$

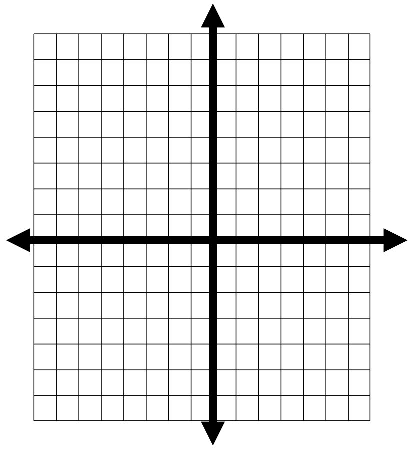
$f(-2) =$

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

$f(-2) =$

$f(6) =$

$f(1) =$

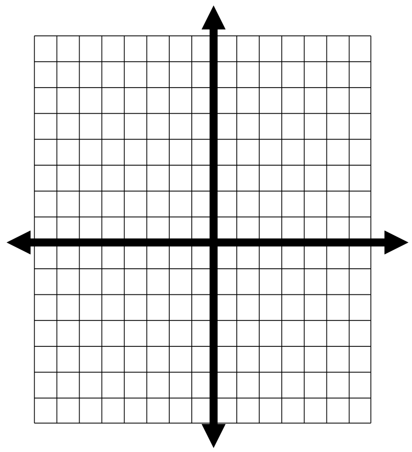


3. $f(x) = \begin{cases} x^2-1 & x \leq 0 \\ 2x-1 & 0 < x \leq 5 \\ 3 & x > 5 \end{cases}$

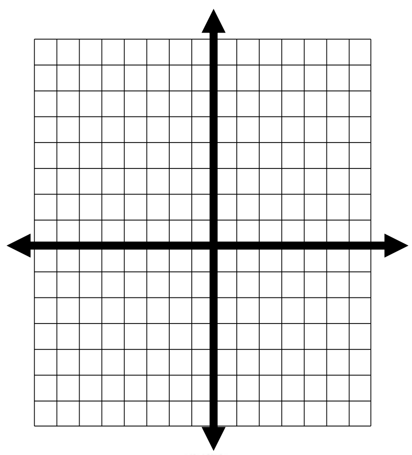
$f(-2) =$

$f(0) =$

$f(5) =$

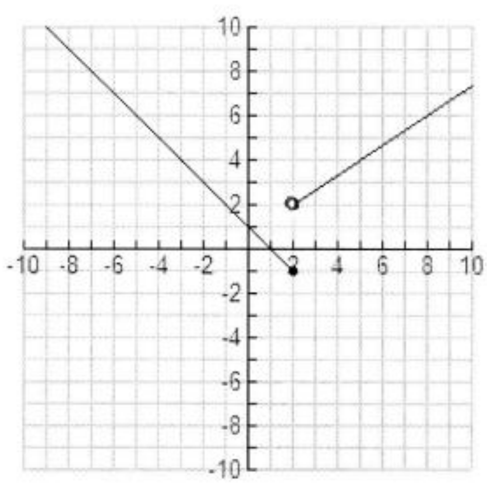


5. $f(x) = \begin{cases} x^2 & x \leq 0 \\ -x^2+4 & x > 0 \end{cases}$

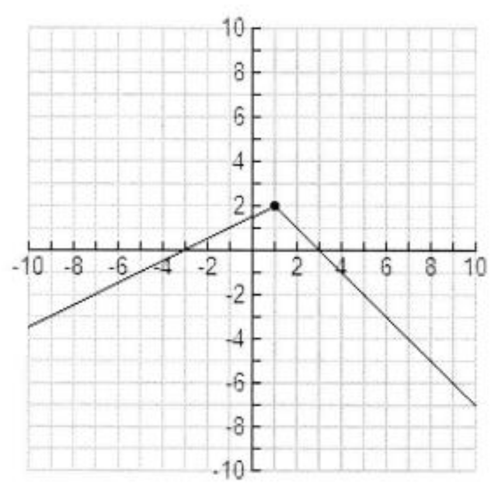


Write the functions for the given graphs

21.



22.



Match the piecewise function with its graph.

15. $f(x)=\begin{cases} x-4, & \text{if } x\le 1 \\ 3x, & x>1 \end{cases}$

16. $f(x)=\begin{cases} x+4, & \text{if } x\le 0 \\ 2x+4, & x>0 \end{cases}$

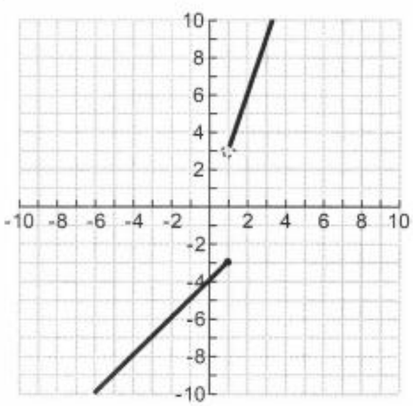
17. $f(x)=\begin{cases} 3x-2, & \text{if } x\le 1 \\ x+2 & x>1 \end{cases}$

18. $f(x)=\begin{cases} 2x+3, & \text{if } x\ge 0 \\ x+4, & x<0 \end{cases}$

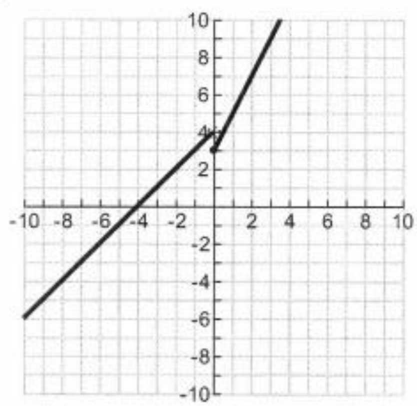
19. $f(x)=\begin{cases} 3x-1, & \text{if } x\ge -1 \\ -5, & x<-1 \end{cases}$

20. $f(x)=\begin{cases} -3x-1, & \text{if } x\le 1 \\ -5, & x>1 \end{cases}$

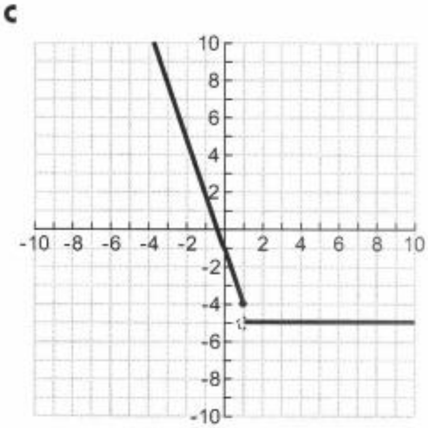
A



B



C



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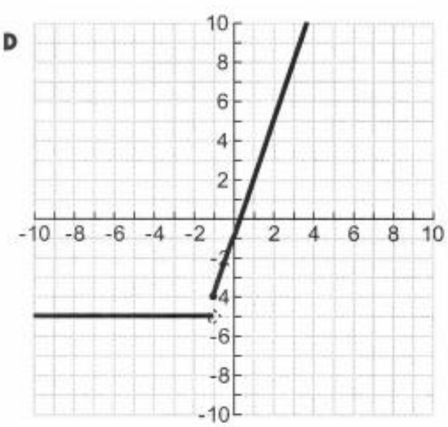

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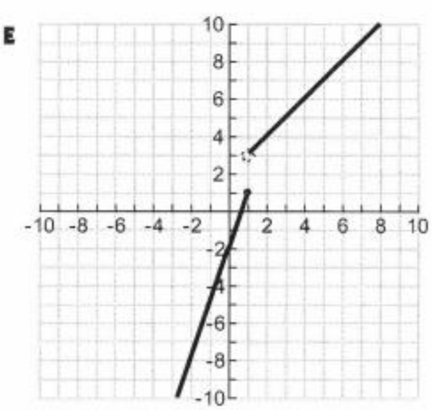

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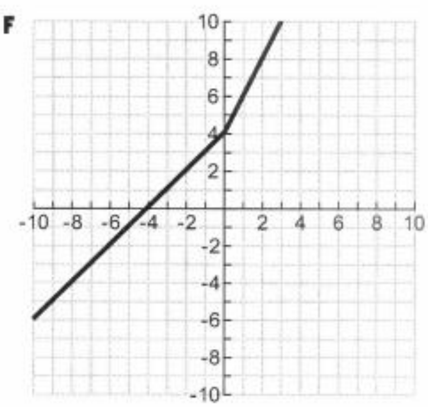


Worksheet: Piecewise Functions

Evaluate the function for the given value of x.

$f(x) = \begin{cases} 3, & \text{if } x \le 0 \\ 2, & \text{if } x > 0 \end{cases}$ $\quad g(x) = \begin{cases} x + 5, & \text{if } x \le 3 \\ 2x - 1, & \text{if } x > 3 \end{cases}$ $\quad h(x) = \begin{cases} \frac{1}{2}x - 4, & \text{if } x \le -2 \\ 3 - 2x, & \text{if } x > -2 \end{cases}$

1. $f(2)$ **2.** $f(-4)$ **3.** $f(0)$ **4.** $f\left(\frac{1}{2}\right)$

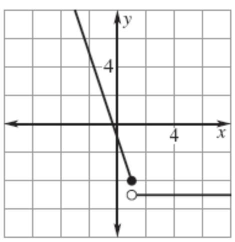
5. $g(7)$ **6.** $g(0)$ **7.** $g(-1)$ **8.** $g(3)$

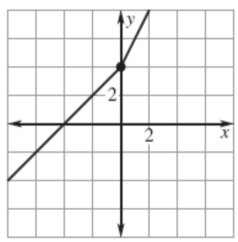
9. $h(-4)$ **10.** $h(-2)$ **11.** $h(-1)$ **12.** $h(6)$

Match the piecewise function with its graph.

13. $f(x) = \begin{cases} x - 4, & \text{if } x \le 1 \\ 3x, & \text{if } x > 1 \end{cases}$ **14.** $f(x) = \begin{cases} x + 4, & \text{if } x \le 0 \\ 2x + 4, & \text{if } x > 0 \end{cases}$ **15.** $f(x) = \begin{cases} 3x - 2, & \text{if } x \le 1 \\ x + 2, & \text{if } x > 1 \end{cases}$

16. $f(x) = \begin{cases} 2x + 3, & \text{if } x \ge 0 \\ x + 4, & \text{if } x < 0 \end{cases}$ **17.** $f(x) = \begin{cases} 3x - 1, & \text{if } x \ge -1 \\ -5, & \text{if } x < -1 \end{cases}$ **18.** $f(x) = \begin{cases} -3x - 1, & \text{if } x \le 1 \\ -5, & \text{if } x > 1 \end{cases}$

A.


B.


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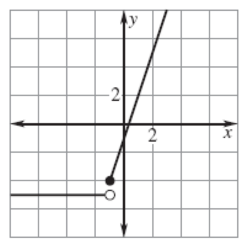

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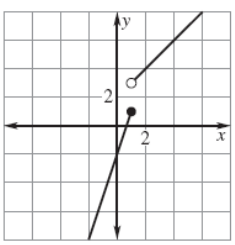

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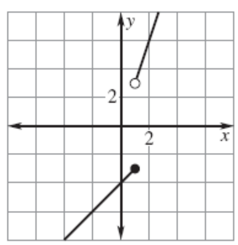

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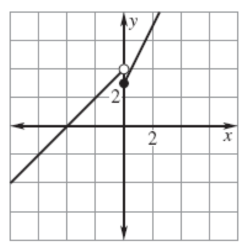

Graph the function.

19.

$$f(x) = \begin{cases} x + 3, & \text{if } x \le 0 \\ 2x, & \text{if } x > 0 \end{cases}$$

20.

$$f(x) = \begin{cases} x + 1, & \text{if } x < 0 \\ -x + 1, & \text{if } 0 \le x \le 2 \\ x - 1, & \text{if } x > 2 \end{cases}$$

21.

$$f(x) = \begin{cases} 2, & \text{if } x \le -3 \\ -1, & \text{if } -3 < x < 3 \\ 3, & \text{if } x \ge 3 \end{cases}$$

22. The admission rates at an amusement park are as follows.

Children 5 years old and under: free
Children between 5 years and 12 years, inclusive: \$10.00
Children between 12 years and 18 years, inclusive: \$25.00
Adults: \$35.00

a) Write a piecewise function that gives the admission price for a given age.
b) Graph the function.