1.1 Relations and Functions

1. Relation: A set of ordered pairs Ex: $\{(2,4),(-3,5),(-1,-3),(8,4)\}$

2. Domain:
The set of all abscissas (x's) of the ordered pairs (abscissa is the first element of an ordered pair)

3. Range:
The set of all ordinates (y's) of the ordered pairs (ordinate is the second element of an ordered pair)

4. Function:
A relation in which each element in the domain is paired with exactly one element in the range.

5. Given {(-3, 2), (1, 8), (-1, -3), (5, 2) }state the domain and range. Is this relation is a function?

6. If x is a negative integer greater than -4, state the relation representing the equation $y = x^2 - 5$
Then state the domain and range.

7. Given x is an integer such that $-2 < x < 5$, state the ordered pairs from $y = 8 - 6x$.

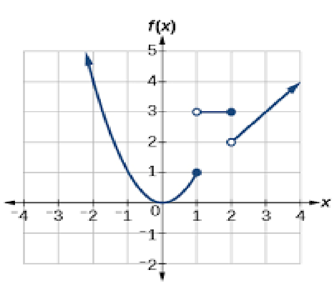
8. Specify one number in the table you could change so that the relation would NOT represent a function.

1960	1970	1980	1990	2000
13,000,000	19,700,000	18,000,000	16,700,000	19,700,000

9. Vertical Line Test:
If a vertical line passes through a graph more than once, the graph is not the graph of a function.

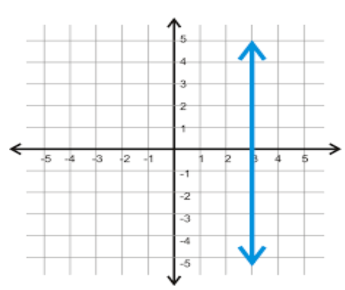
10. Determine if the graph of each relation is the set of a function

a.



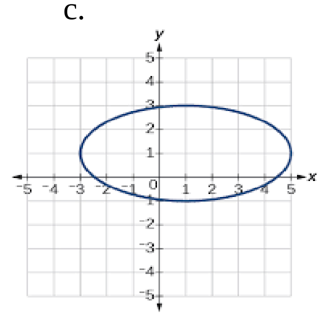
Yes/ No

b.



Yes/ No

c.



Yes/ No

1. **Function Notation:**
$f(x)$, which is read "*f* of x." Interpreted as the value of the function *f* at x. $y = f(x)$ indicated that for each element in the domain that replaces x, the functions assigns one and only one replacement for y. Coordinates are (x, y)or $(x, f(x))$.

2. Find $f(-1)$ if $f(x) = -x^3 - 1$

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

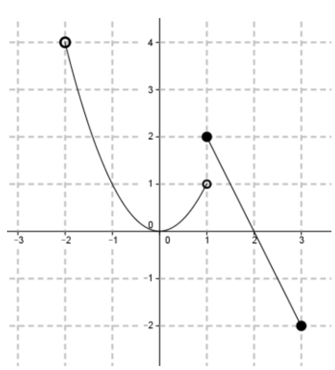
4. Factor each of the following expression.
   a. $x^2 + 7x - 18$ b. $2n^2 + 13n - 24$ c. $3m^2 - 7m - 20$

   d. $4m^2 - 11m - 3$ e. $2w^3 - 8w$

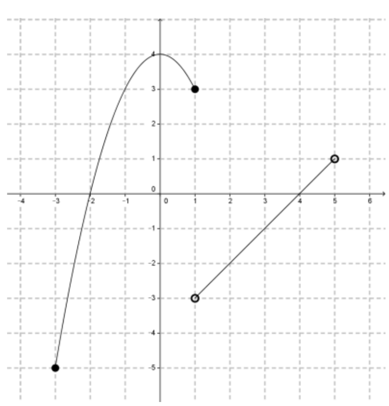
5. To find domain for a function, it is easiest to start by finding values that are not in the domain. Once you have found the values that are not in the domain then you can exclude those values when stating the domain.

6. State the domain in interval notation.
   a. $f(x) = \dfrac{x^2}{x+1}$ b. $f(x) = \sqrt{x+3}$ c. $f(x) = \sqrt{5-x}$ d. $f(x) = \dfrac{x}{x^2 - 12}$

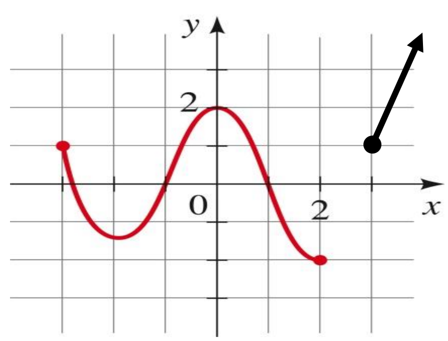
e.



f.



g.



Domain: ____________________ Domain: ________________________ Domain: ___________________

7. **General Rules for finding Domain:**

a. Linear function

b. Quadratic Functions

c. Square Root Functions

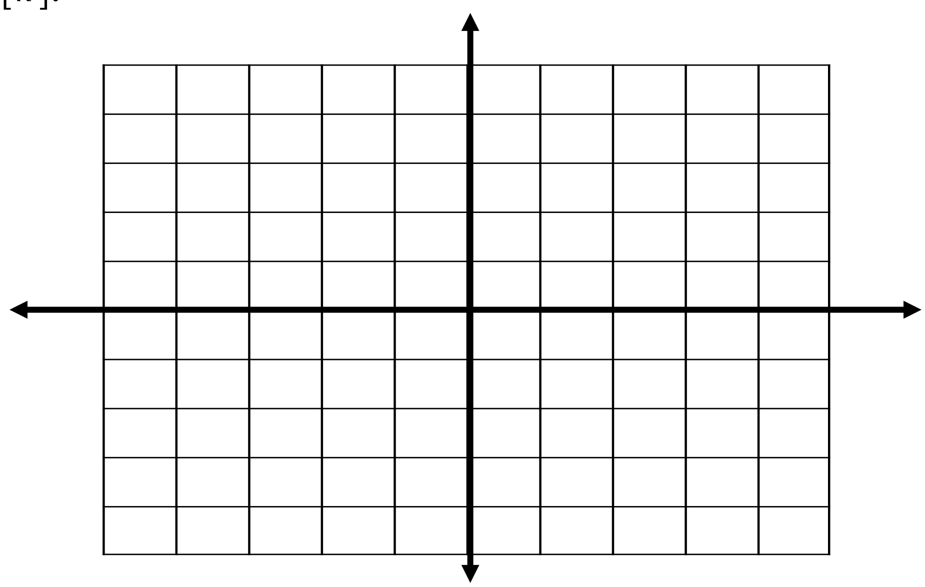
d. Rationals (fractions with variables in the denominator)

17. Greatest Integer Function (also known as the birthday function)

A type of step function. The symbol $[x]$ means the integer Not Greater than x. **ROUND DOWN!!!!!**

18. Fill in the table and graph for $y = [x]$.

x	y
-1.7	
-1.5	
-1.2	
-1.0	
-0.9	
-0.4	
0	
0.3	
0.7	
1.0	
1.5	
1.8	
2.0	
2.6	



19. Evaluate each for $f(x) = [x]$ and $g(x) = [3x] - 2$

a. $f(0.2)$= _______ b. $f(2.9)$ = ________ c. $f(9)$ = ______ d. $f(-0.3)$ = _____

e. $g(-1.2)$ = ______ f. $g(-5.5)$ = ________ g. $g(-6)$ = _______ h. $g(0.1)$ = _____

Homework: Function Wksht & Domain Wksht

1.1 Function Worksheet Day 1 Homework

I. State the domain and range if each relation. Then state whether the relation is a function. Write yes or no.

1. $\{(-1,2),(3,10),(-2,20),(3,11)\}$

2. $\{(0,2),(13,6),(2,2),(3,1)\}$

3. $\{(1,4),(2,8),(3,24)\}$

4. $\{(-1,-2),(3,54),(-2,-16),(3,81)\}$

II. Given that x is an integer, state the relation representing each of the following by listing a set of ordered pairs. Then state whether the relation is a function. Write yes or no.

5. $y = 3x^2 - 5$ and $0 < x < 5$

6. $y^2 = 3x^2$ *and* $x = -3$

7. $|3x + 4| = y$ and $0 < x < 3$

8. $y = |x|$ and $0 < x < 2$

III. The symbol $[x]$ means the greatest integer not greater than x. If $f(x) = [2x] - 3x$, find each value.

9. *f*(0)

10. *f*(0.3)

11. *f*(-3.9)

12. *f*(x – 1)

VI. Given $f(x) = |3x - 4| + 5$, find each value.

13. $f\left(\dfrac{1}{3}\right)$

14. *f*(0.5)

15. *f*(-0.7)

16. *f*(5d)

V. Find the domain of each function. Put each answer in interval notation.

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

18. $f(x) = \dfrac{1}{2x-5}$

19. $f(x) = \sqrt{25 - x}$

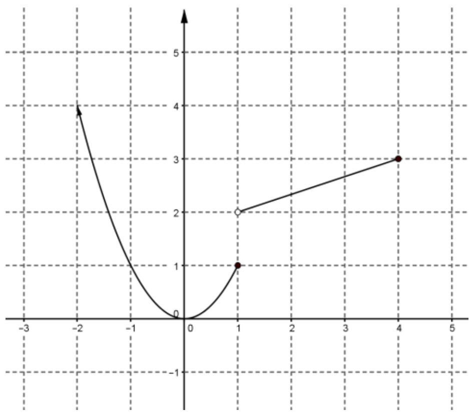
20. $f(x) = \dfrac{x-10}{\sqrt{x+16}}$

21. $f(x) = \dfrac{x^2+25}{x^2-25}$

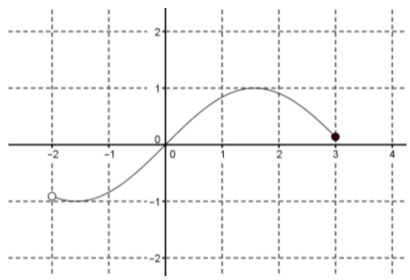
22. $f(x) = \dfrac{x-7}{x^2-1}$

Dom Wksht: Find the domain of the following graphs and equations. **Write your answer in interval notation.**

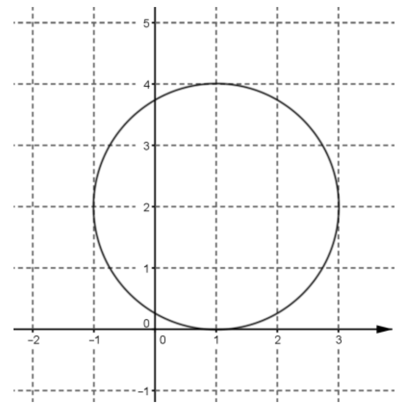
1.



2.



3.

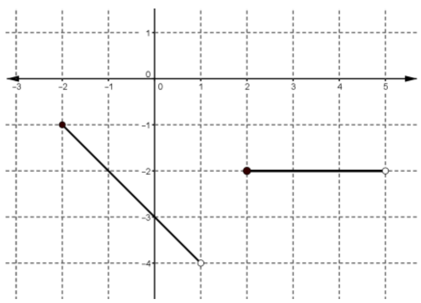


1. ______________________________
Function? _______

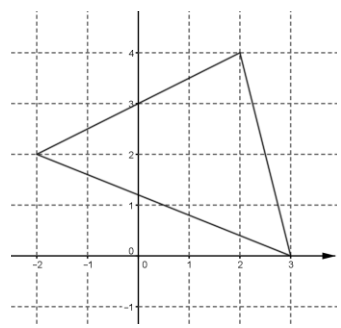
2. ___________________________
Function? ________

3. __________________________
Function? _______

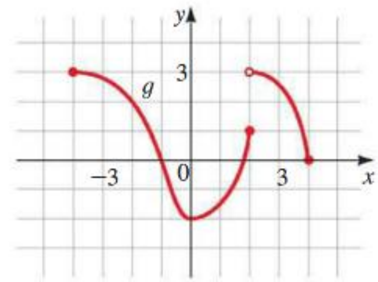
4.



5.



6.

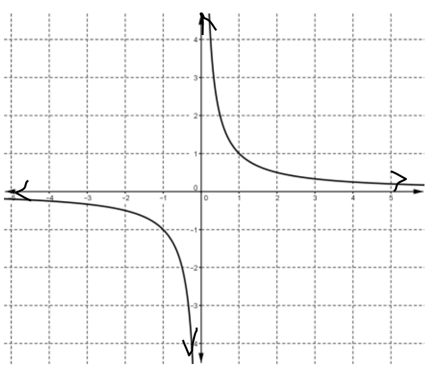


4. ___________________________
Function? _________

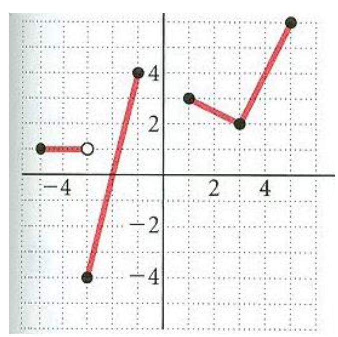
5. _______________________________
Function? ____________

6. ________________________
Function? _______________

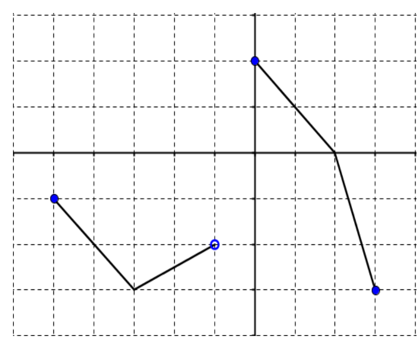
7.



8.



9.



7. ____
Function? ___________

8. ____________________________
Function? ____________

9. _________________________
Function? ________________

10. $f(x) = \sqrt{3x-18}$ _________________

11. $f(x) = x^2 + 2$ __________________

12. $h(x) = \dfrac{2x}{x^2 - 4}$ ____________________________

13. $g(x) = \dfrac{4}{x+9}$ ____________________________

3.2 Families of Graphs:

1. Reflection
   Flips a figure over a line called the axis of symmetry.

2. Linear Translation
   Relocates a graph on the coordinate plane but does not change the shape or size.

3. Geometric Transformation: Sometimes called dilations.

4. Summary of Translations and Transformations

If the equation of $y = f(x)$ is change to:	Then the graph of $y = f(x)$ is:
$y = -f(x)$	Reflected in the x-axis
$y = f(-x)$	Reflected in the y-axis
$y = cf(x), \lvert c \rvert > 1$	Stretched vertically by a factor of c
$y = cf(x), 0 < \lvert c \rvert < 1$	Shrunk vertically by a factor of c
$y = f(x - h)$	Translated h units horizontally
$y = f(x)\ k + k$	Translated k units vertically
$y = f(cx), \lvert c \rvert > 1$	Shrunk horizontally by a factor of $\frac{1}{c}$
$y = f(cx), 0 < \lvert c \rvert < 1$	Stretch horizontally by a factor of $\frac{1}{c}$

5. When listing translations/transformation, **ORDER MATTERS**!!!!!

6. List the transformations, in order, that have occurred when compared to the parent graph.

   a. $g(x) = -x^2 - 2$

   b. $f(x) = x^2 + 1$

   c. $h(x) = (x - 2)^2$

   d. $n(x) = (x + 3)^2$

   e. $m(x) = -(x - 3)^2$

   f. $s(x) = -(x + 5)^2$

   g. $t(x) = (x - 2)^2 + 3$

   h. $h(x) = (x + 8)^2 - 6$

   i. $a(x) = 3(x + 2)^2$

   j. $g(x) = \frac{1}{3}(x + 6)^2$

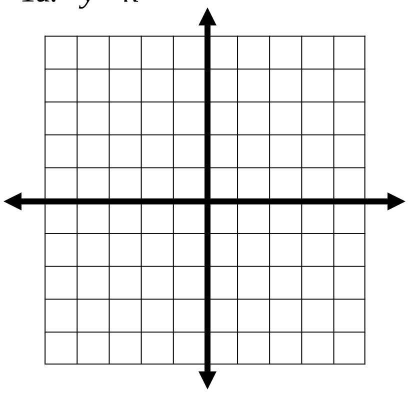
   k. $f(x) = (-x)^3$

   l. $h(x) = \left(\frac{1}{2}(x + 2)^2\right)$

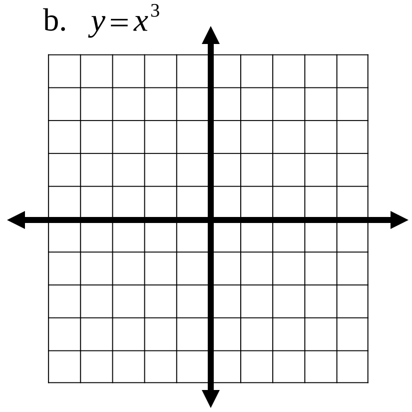
AFM Unit 1 Day 2 notes

Parent Graphs

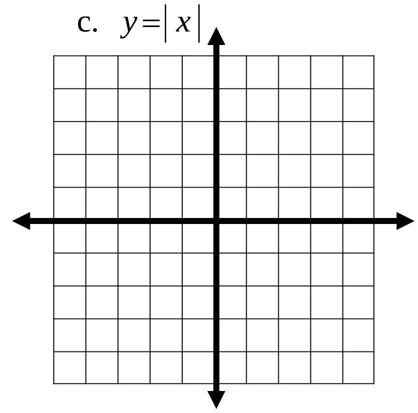
1a. $y = x^2$



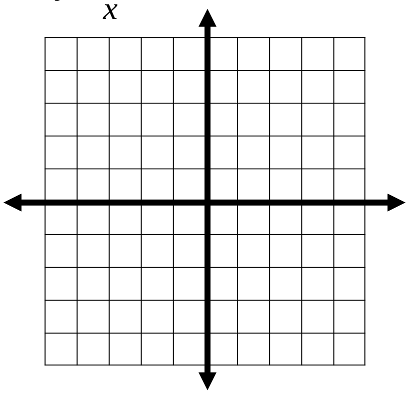
b. $y = x^3$



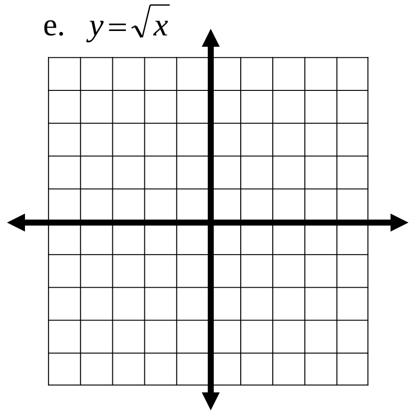
c. $y = |x|$



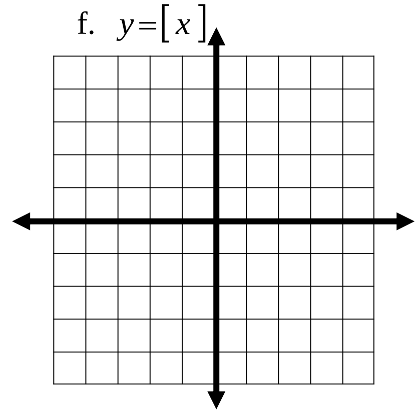
d. $y = \frac{1}{x}$ or x^{-1}



e. $y = \sqrt{x}$

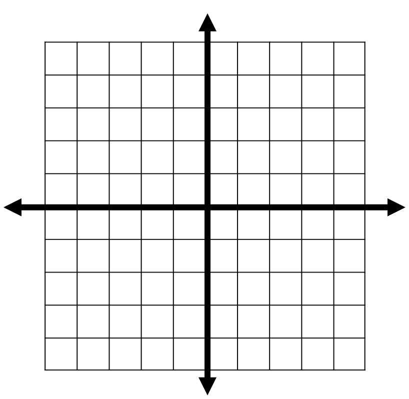


f. $y = [x]$

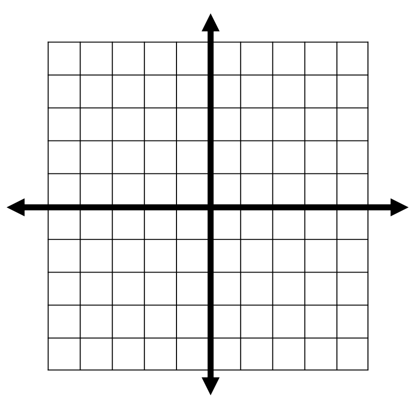


7. Graph each function. Then describe how each graph is related to the parent graph. Then state the domain and range.

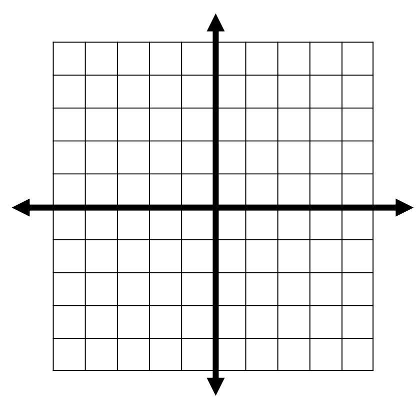
a. $f(x) = 2x^2 - 3$



b. $g(x) = -3|x| + 2$



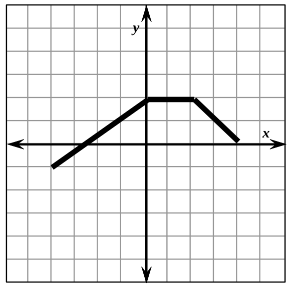
c. $h(x) = \left[\frac{1}{2}x + 1\right]$



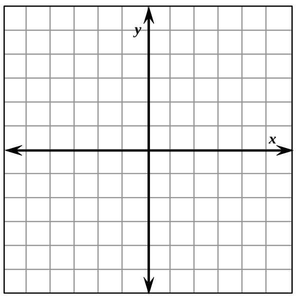
Extra Examples: On Board

8. Use the graph of the function f to sketch the graph of the given function g. State the domain and range.

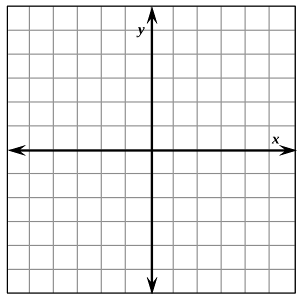
$f(x)$



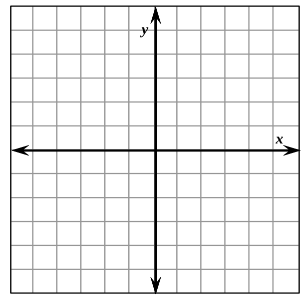
a. $g(x) = f(x) + 1$



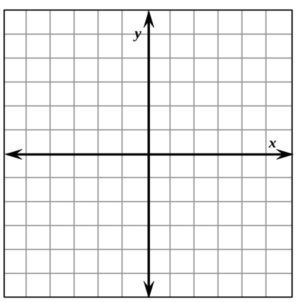
b. $g(x) = f(x + 2)$



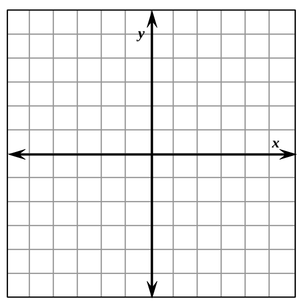
c. $g(x) = -f(x)$



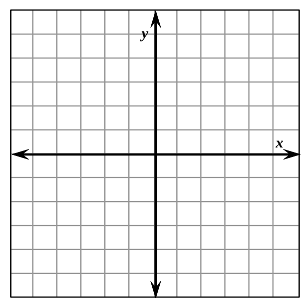
d. $g(x) = \frac{1}{2} f(x)$



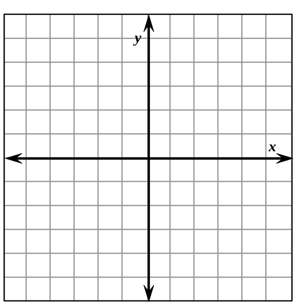
e. $g(x) = 2f(x)$



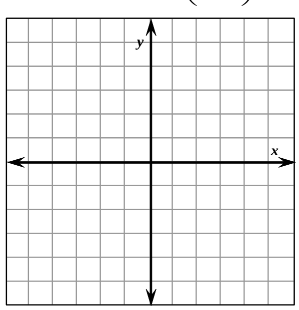
f. $g(x) = f(-x)$



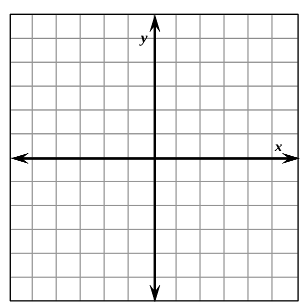
g. $g(x) = f(2x)$



h. $g(x) = f\left(\frac{1}{2}x\right)$



i. $g(x) = f(-x - 2) + 1$

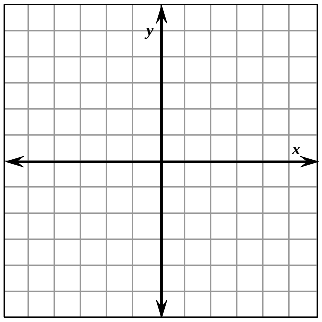


Homework: Transformation Worksheet

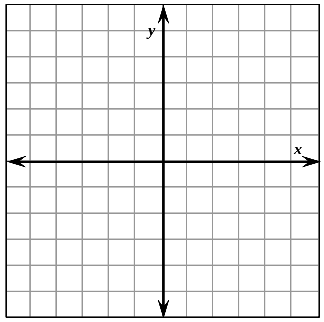
3.2 Graphing Transformations Day 2 Worksheet Homework

I. Graph each function as a transformation of its parent graph.

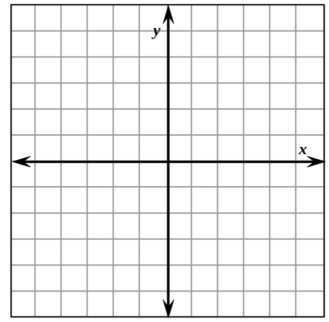
1. $f(x) = |x + 2| - 3$



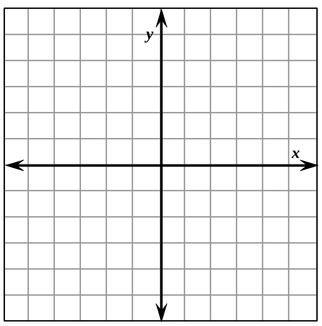
2. $f(x) = -2|x - 1|$



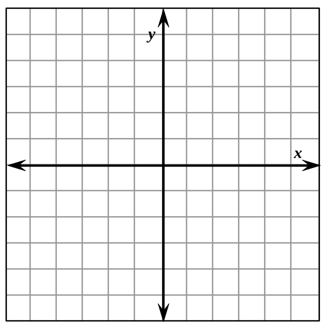
3. $p(x) = -x^2 + 2$



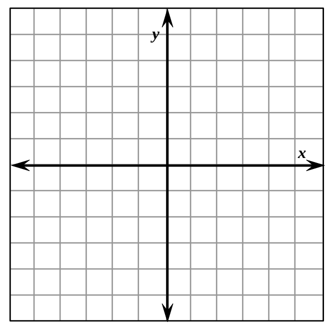
4. $p(x) = 2(x + 3)^2$



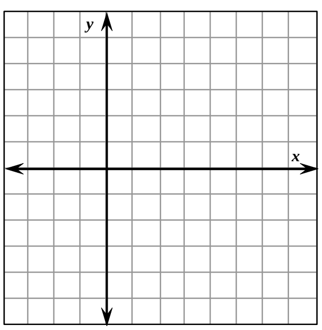
5. $h(x) = 3[x]$.



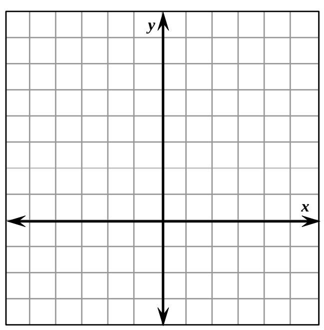
6. $h(x) = [2x]$



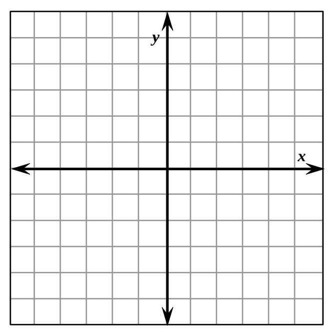
7. $h(x) = [x - 3]$



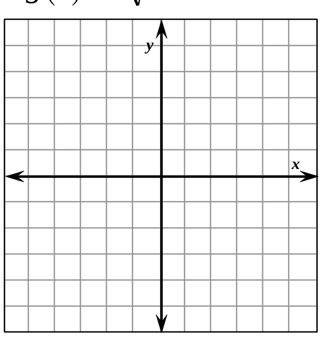
8. $h(x) = x^3 + 3$



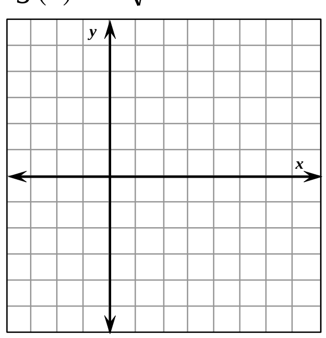
9. $g(x) = \sqrt{x + 4}$



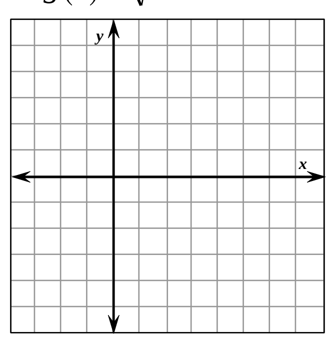
10. $g(x) = 3\sqrt{x}$



11. $g(x) = -\sqrt{x - 2}$



12. $g(x) = \sqrt{2x - 6}$



II. Write the transformations, in order, for each function when compared to their parent graph.

13. $f(x) = |2x - 4|$

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

15. $f(x) = -4[x - 8]$

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

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

III. Evaluate each.

18. [6.1]

19. [0.7]

20. [-0.5]

21. [6] + 1

22. [-1.2] – 5

23. 2[3.1] – 2.1

24. [7.9] – 7

25. [-8.1]

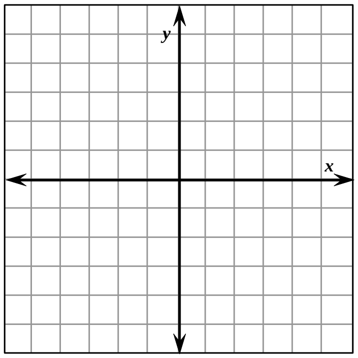
26. $\left[-\frac{3}{4}\right]$

27. $\left[-\frac{7}{4}\right] + 2$

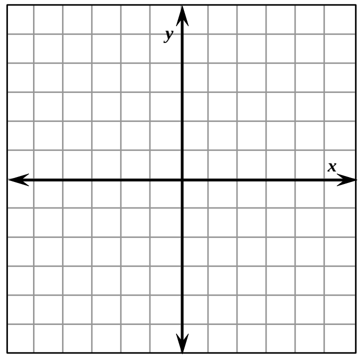
3.2 Day 3 Notes

9. Graph each transformation of $y = \frac{1}{x}$.

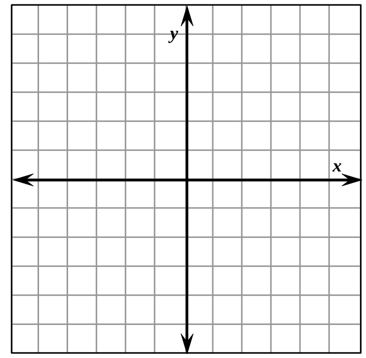
a. $y = \frac{1}{x}$



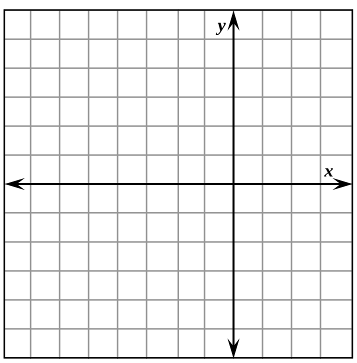
b. $y = \frac{1}{x} + 2$



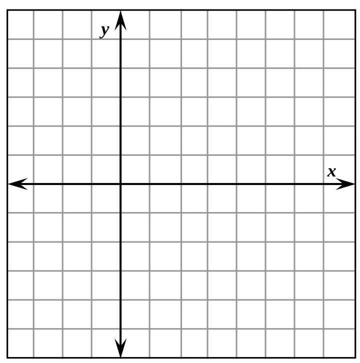
c. $y = \frac{1}{x} - 1$



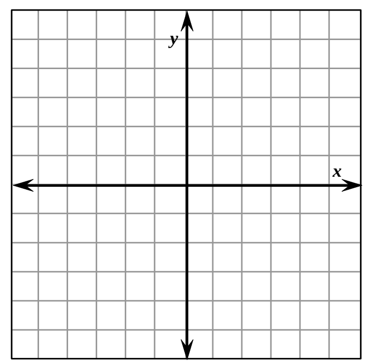
d. $y = \frac{1}{x + 2}$



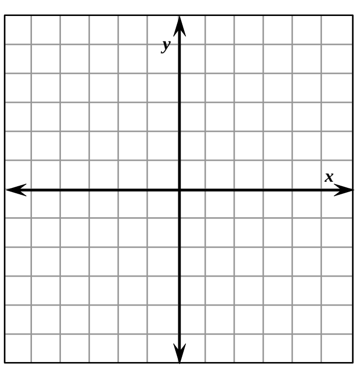
e. $y = \frac{1}{x - 3}$



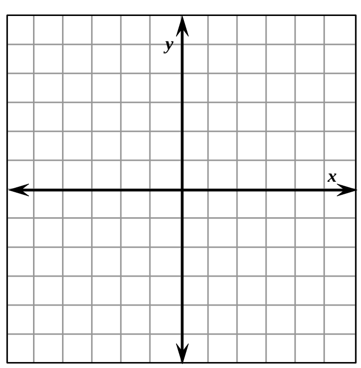
f. $y = \frac{2}{x}$



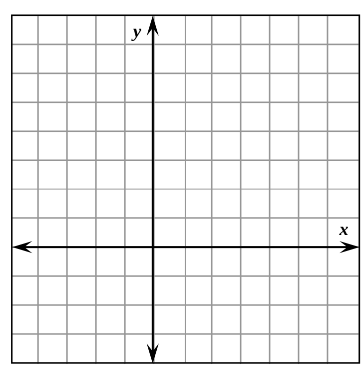
g. $y = -\frac{3}{x}$



h. $y = \frac{2}{x} + 1$

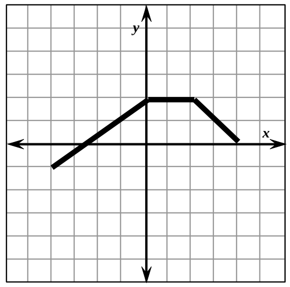


i. $y = \frac{1}{x - 1} + 3$

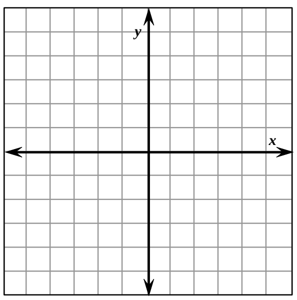


10. Use the graph of the function *f* to sketch the graph of the given function g. Then state the domain and range.

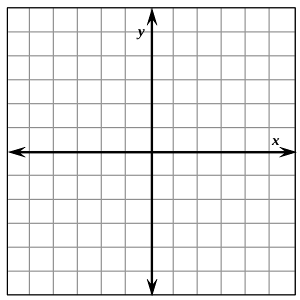
$f(x)$



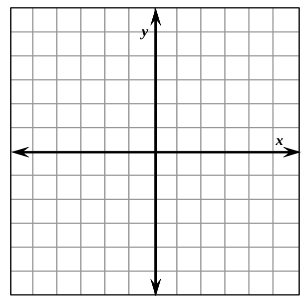
b. $g(x) = |f(x)| + 1$



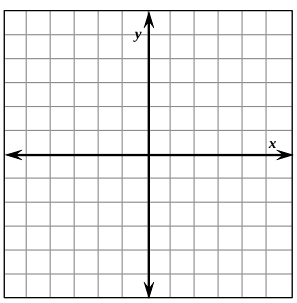
b. $g(x) = |f(x+2)|$



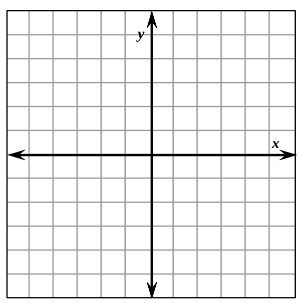
c. $g(x) = -|f(x)|$



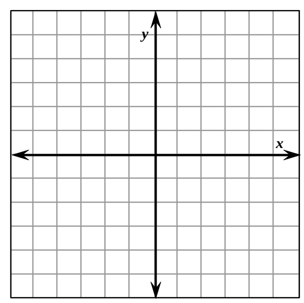
d. $g(x) = |f(x-1)| - 3$



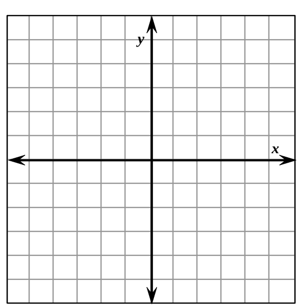
e. $g(x) = |f(x+1) - 2|$



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



Write your own equation for g and graph below:

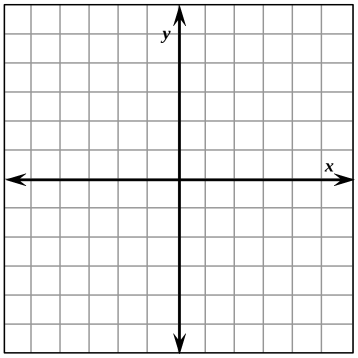


Homework: Graphing Practice Day 3

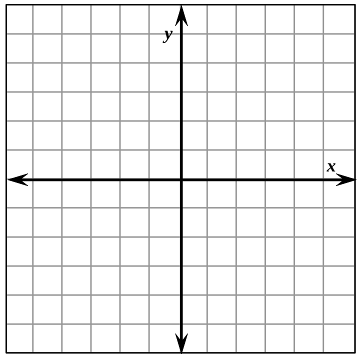
3.2 Transformation Graphing Practice Day 3

Graph and list the transformations. Day 3 Homework

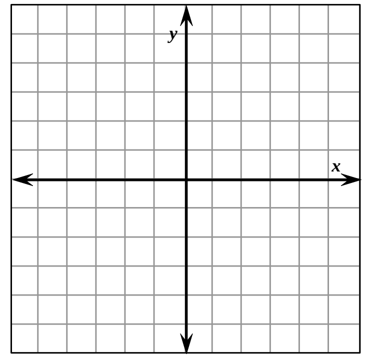
1. $f(x) = 0.5[x]$



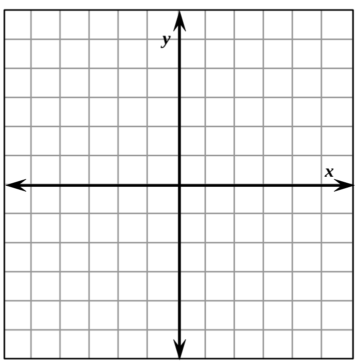
2. $y = [x+3]+2$



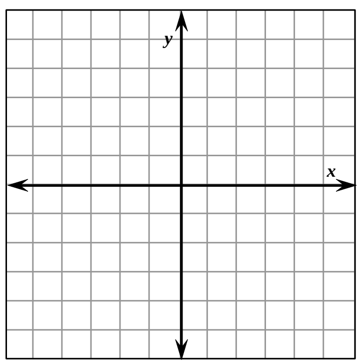
3. $y = [2x]-1$



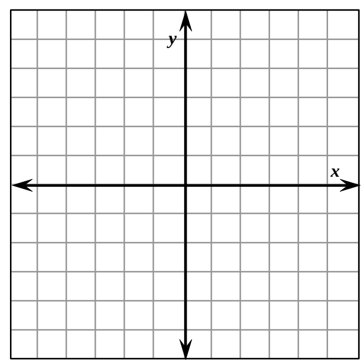
4. $y = -2[x]$



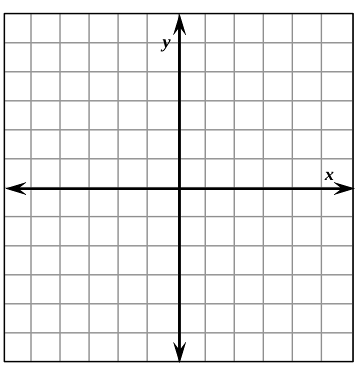
5. $y = [4x]$



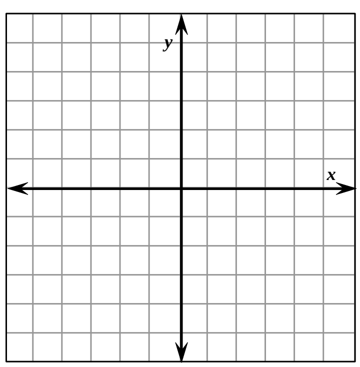
6. $|x| + y = 3$



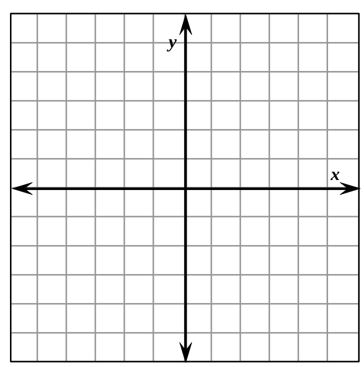
7. $y = |x+3|-5$



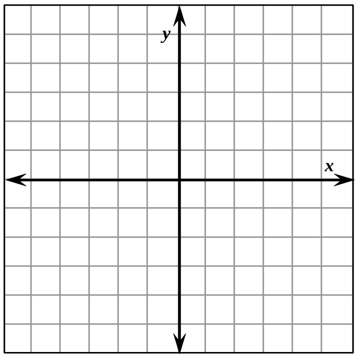
8. $y = -3|x-2|+1$



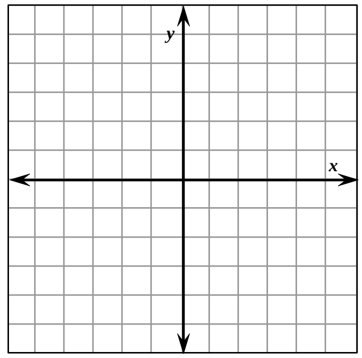
9. $y = \frac{1}{2}|x-1|$



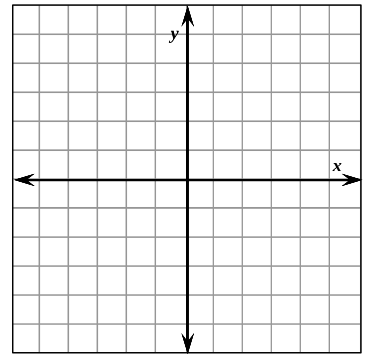
10. $y=-|2x-2|$



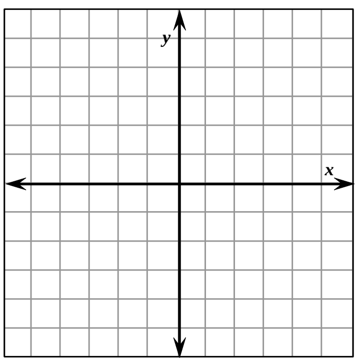
11. $y=|3x|$



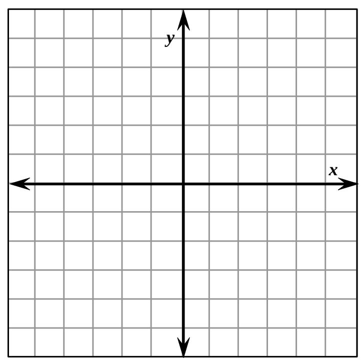
12. $y=\sqrt{x+2}$



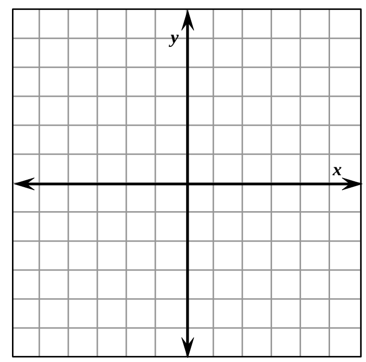
13. $y=\sqrt{x-3}$



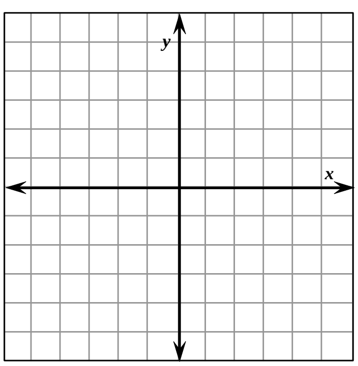
14. $y=\sqrt{x}+2$



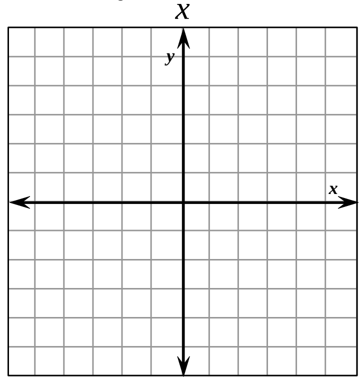
15. $y=4\sqrt{x}-2$



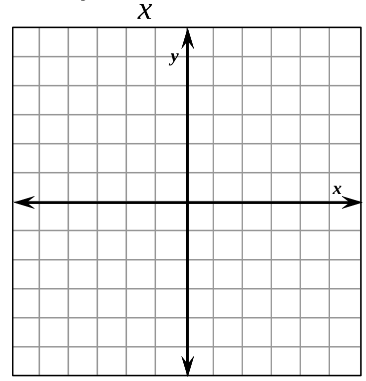
16. $y=\sqrt{3x+6}$



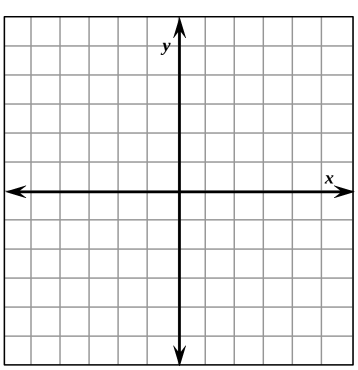
17. $y=\dfrac{1}{x}+2$



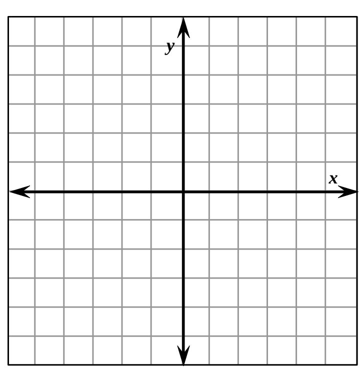
18. $y=\dfrac{3}{x}$



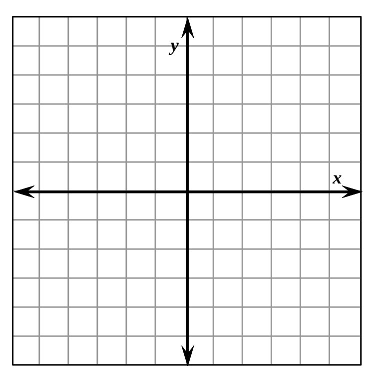
19. $y=-\dfrac{1}{x+2}$



20. $y=3(x-2)^2$



21. $y=-0.5(x+1)^2$



3.4 Rational Functions Day 4

1. Rational Function

   The equation of two polynomials, $\frac{g(x)}{f(x)}$ where $f(x) \neq 0$ Parent Rational Function is $\frac{1}{x}$.

   Definition of a Vertical and Horizontal Asymptotes

   a. The line $x = a$ is a vertical asymptote of the graph of f if $f(x) \to \infty$ or $f(x) \to -\infty$ as $x \to a$, either right or from the left.

   b. The line $y = b$ is a horizontal asymptote of the graph of f if $f(x) \to b$ as $x \to -\infty$ or $x \to -\infty$.

1. **Holes:** Occur when there is a common FACTOR in the numerator and denominator. To find the exact location of the hole, set the common factor equal to zero, then take that value and substitute it back into the **SIMPLIFIED** rational equation.

   Ex: $h(x) = \frac{5(x-2)}{(x+4)(x-2)}$ therefore the hole is located at (2, f(2)) which is $\left(2, \frac{5}{6}\right)$.

2. **Vertical Asymptotes:** these occur at the x-value that makes the denominator equal to zero.

   Ex: $g(x) = \frac{5}{x-2}$ has a vertical asymptote at x = 2.

   Ex: $f(x) = \frac{3x}{(x-4)(x+2)}$ has two vertical asymptotes one at x = 4 and one at x = -2.

3. **Horizontal Asymptotes:** A rational function has **at most** one horizontal asymptote.

   Three conditions: Given f(x) = $\frac{p(x)}{q(x)} = \frac{a_n x^n + a_{n-1}..a_0}{b_m x^m + b_{m-1} x^{m-1}...b_0}$

   1. if n > m then f has no horizontal asymptote (**it may have a slant asymptote**)

      Ex. $p(x) = \frac{3x^2+4}{x+2}$

   2. if n = m then f has a horizontal asymptote at y = $\frac{a^n}{b^m}$ (leading coefficients)

      Ex: $g(x) = \frac{3x^2+4}{4x^2+2x-5}$ horizontal asymptote at y = $\frac{3}{4}$.

3. if n < m then y = 0 is the horizontal asymptote

Ex: $f(x) = \dfrac{2x+1}{3x^2+6x+2}$ horizontal asymptote at y = 0.

Slant Asymptote: They are exactly how they sound. *Neither vertical or horizontal!! These occur only if the degree of the numerator is <u>exactly</u> one more than the degree of the denominator.

Need to do synthetic or long division to find it.

Ex. $p(x) = \dfrac{x^2-2x+1}{x+3}$

Ex: $w(x) = \dfrac{3x^2+4}{x+2}$

4. Determine the vertical and horizontal asymptotes of the function, (include slant, if one). Also list any holes, if any. Then state the domain.

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

Hole:
VA:
Domain:
HA:
SA:
x-intercept:
y-intercept:

b. $f(x) = \dfrac{-2x+1}{3x+5}$

Hole:
VA:
Domain:
HA:
SA:
x-intercept:
y-intercept:

c. $f(x) = \dfrac{3}{x^2+4}$

Hole:
VA:
Domain:
HA:
SA:
x-intercept:
y-intercept:

d. $g(x) = \dfrac{x^2-1}{x^2-6x-7}$

Hole:
VA:
Domain:
HA:
SA:
x-intercept:
y-intercept:

e. $g(x) = \dfrac{x^2-6x+9}{x^2-x-6}$

Hole:
VA:
Domain:
HA:
SA:
x-intercept:
y-intercept:

f. $f(x) = \dfrac{x^2+6x+8}{x+4}$

Hole:
VA:
Domain:
HA:
SA:
x-intercept:
y-intercept:

g. $p(x) = \dfrac{12x}{3x^2+1}$

Hole:
VA:
Domain:
HA:
SA:
x-intercept:
y-intercept:

h. $g(x) = \dfrac{2x^3}{x^2+1}$

Hole:
VA:
Domain:
HA:
SA:
x-intercept:
y-intercept:

i. $g(x) = \dfrac{x^2-9}{x+2}$

Hole:
VA:
Domain:
HA:
SA:
x-intercept:
y-intercept:

Homework Rational Worksheet

Rational Worksheet Day 4 Homework

I. List all the horizontal, vertical and slant asymptotes, holes, and state the domain.

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

Hole:
VA:
Domain:
HA:
SA:
x-intercept:
y-intercept:

2. $h(x) = \dfrac{x-1}{(2x-1)(x-5)}$

Hole:
VA:
Domain:
HA:
SA:
x-intercept:
y-intercept:

3. $g(x) = \dfrac{x-2}{x^2+4x+3}$

Hole:
VA:
Domain:
HA:
SA:
x-intercept:
y-intercept:

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

Hole:
VA:
Domain:
HA:
SA:
x-intercept:
y-intercept:

5. $p(x) = \dfrac{(x+1)^2}{x^2-1}$

Hole:
VA:
Domain:
HA:
SA:
x-intercept:
y-intercept:

6. $p(x) = \dfrac{x^2+3x-3}{x+4}$

Hole:
VA:
Domain:
HA:
SA:
x-intercept:
y-intercept:

7. $g(x) = \dfrac{x^2+3x-4}{x}$

Hole:
VA:
Domain:
HA:
SA:
x-intercept:
y-intercept:

8. $f(x) = \dfrac{2x}{2x-8}$

Hole:
VA:
Domain:
HA:
SA:
x-intercept:
y-intercept:

9. $h(x) = \dfrac{x^2-9}{x-3}$

Hole:
VA:
Domain:
HA:
SA:
x-intercept:
y-intercept:

10. $f(x) = \dfrac{2}{x-4}$

Hole:
VA:
Domain:
HA:
SA:
x-intercept:
y-intercept:

11. $g(x) = \dfrac{x^2-6x+9}{x^2-x-6}$

Hole:
VA:
Domain:
HA:
SA:
x-intercept:
y-intercept:

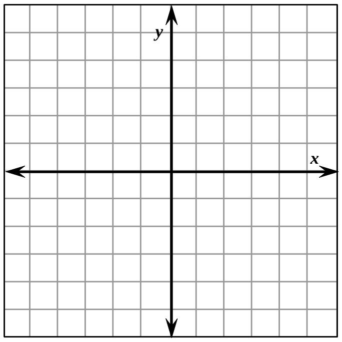
12. $f(x) = \dfrac{(x-2)^2(x+1)^2}{(x-2)(x+1)}$

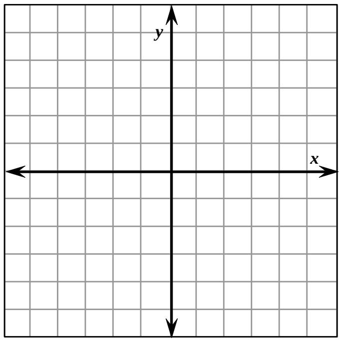
Hole:
VA:
Domain:
HA:
SA:
x-intercept:
y-intercept:

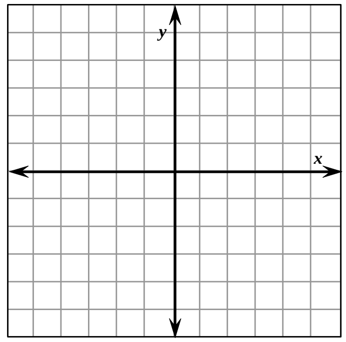
3.4 Rational Notes Day 5

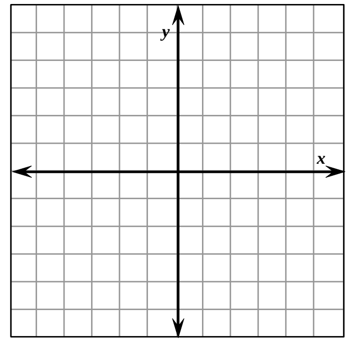
5. Use the parent graph $f(x) = \frac{1}{x}$ to graph each equation. Describe transformation(s) that have taken place. Then list the domain and range.

a. $g(x) = \frac{1}{x-1}$ b. $f(x) = \frac{2}{x}$ c. $k(x) = -\frac{4}{x}$ d. $f(x) = \frac{1}{x+3} - 2$









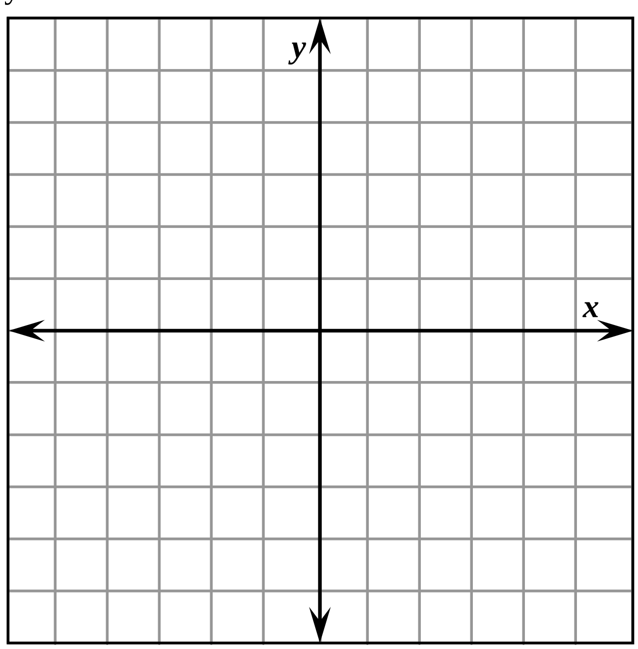
6. Write an equation of a function that has a vertical asymptote at $x = -1$ and a hole at $x = 4$

7. When graphing a rational function that is not a standard transformation of $\frac{1}{x}$ then there are some steps to take to make it easier to graph, without using a graphing calculator.

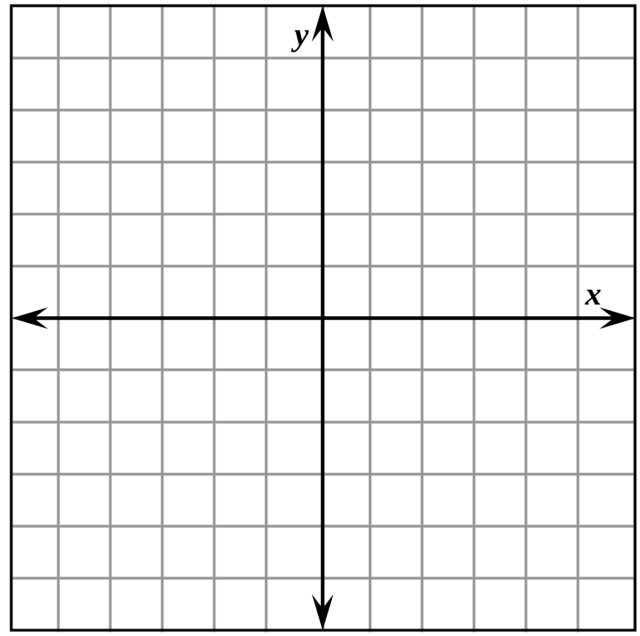
   a. Factor and simplify if possible. Look for any Holes!
   b. Identify any Vertical, Horizontal, Slant asymptotes.
   c. Find the y-intercept, if one
   d. Find the x-intercepts, if any.
   e. Start to sketch the function with the information you have!

8. Graph each function.

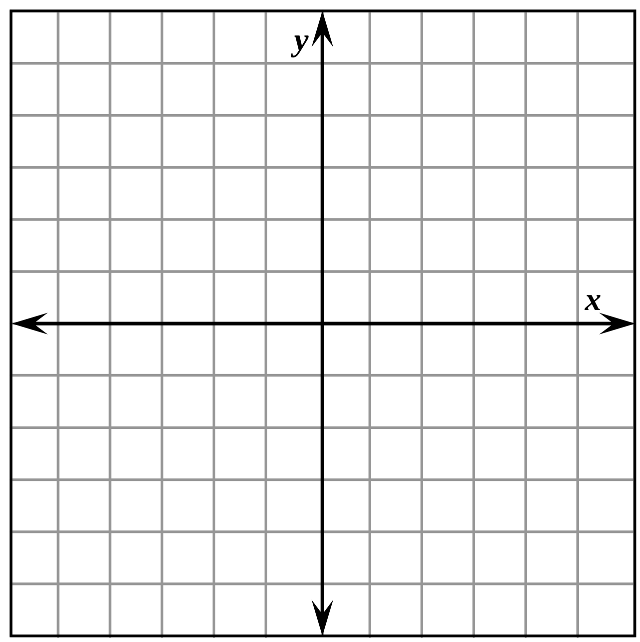
   a. $f(x) = \frac{3x-2}{x+3}$



b. $f(x) = \dfrac{2x^2 - 5x - 7}{x - 2}$



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

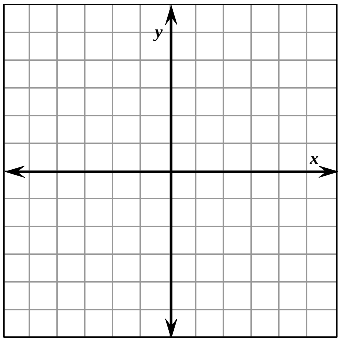


Homework: Day 2 Rational Function Worksheet

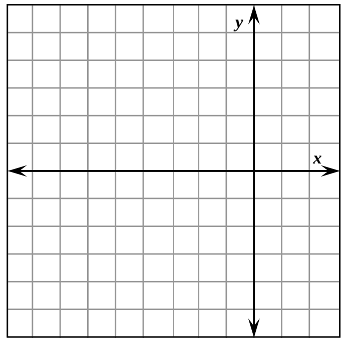
Rational Functions Day 5 Worksheet

1. Describe the transformations that have taken place when compared to a the parent graph of $f(x)=\dfrac{1}{x}$ then graph each one.

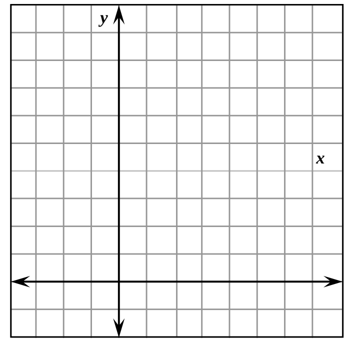
a. $f(x)=\dfrac{1}{x}-1$



b. $g(x)=\dfrac{1}{x+5}$



c. $p(x)=\dfrac{1}{x-3}+4$



2. Create a function of the form y = *f*(x) that satisfies each set of conditions.

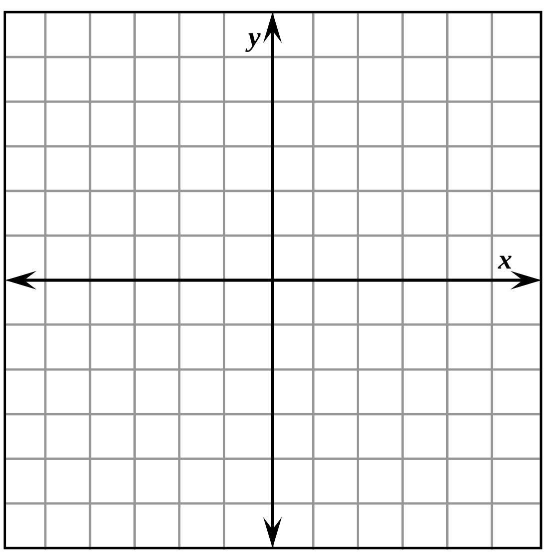
a. Vertical asymptotes at $x=4$, hole at $x=0$

b. Vertical asymptotes at $x=-5$ and $x=1$, hole at $x=-1$

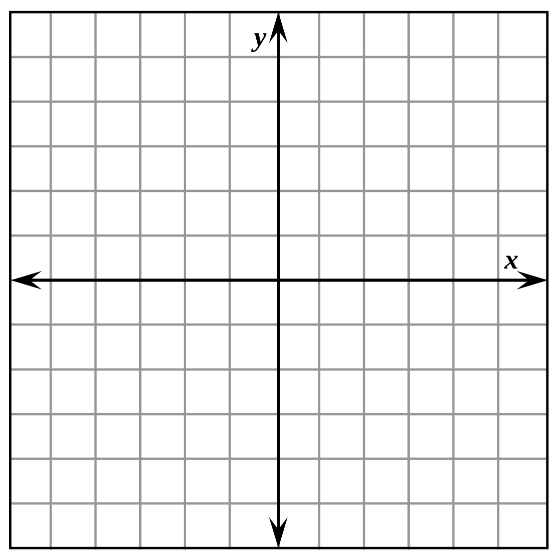
c. Holes at $x=3$ and $x=-7$, resembles $y=x$

Graph each function.

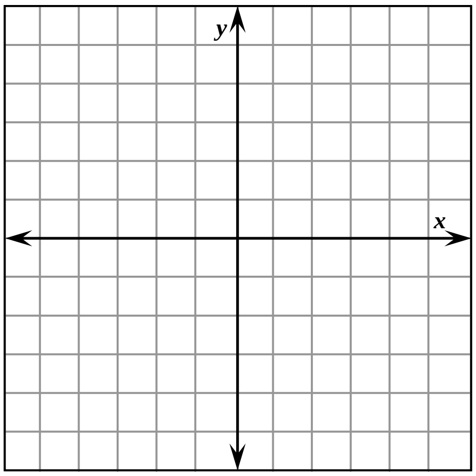
3. $g(x)=\dfrac{x-5}{x+1}$



4. $g(x)=\dfrac{(x+2)(x-2)}{x-2}$

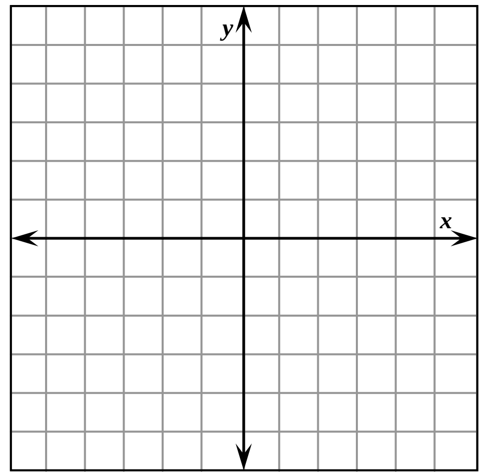


5. $g(x) = \dfrac{x}{x-3}$



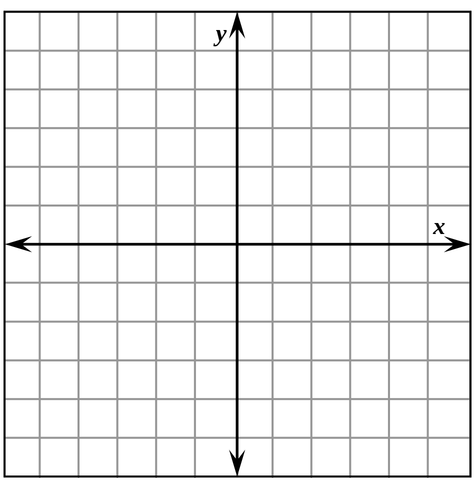
Hole:
VA:
Domain:
HA:
SA:
x-intercept:
y-intercept:

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



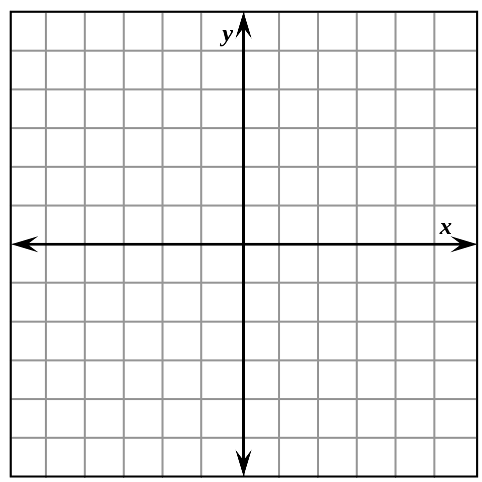
Hole:
VA:
Domain:
HA:
SA:
x-intercept:
y-intercept:

7. $g(x) = \dfrac{x^2 - x}{x}$



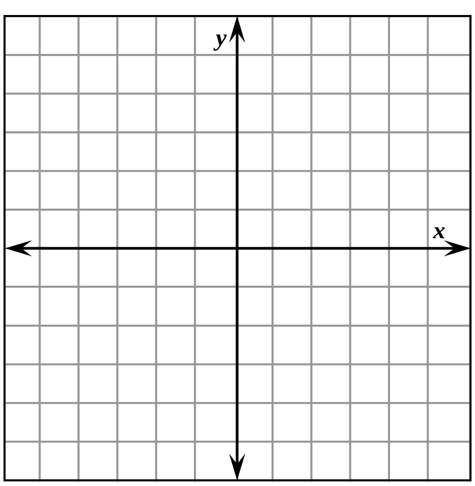
Hole:
VA:
Domain:
HA:
SA:
x-intercept:
y-intercept:

8. $f(x) = \dfrac{-5}{(x-3)(x+1)}$



Hole:
VA:
Domain:
HA:
SA:
x-intercept:
y-intercept:

9. $g(x) = \dfrac{x^2 + 3x - 4}{x}$



Hole:
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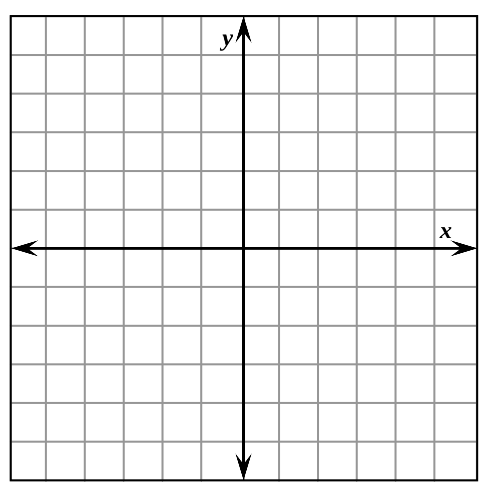
Domain:
HA:
SA:
x-intercept:
y-intercept:

10. $f(x) = \dfrac{x}{1 - x^2}$



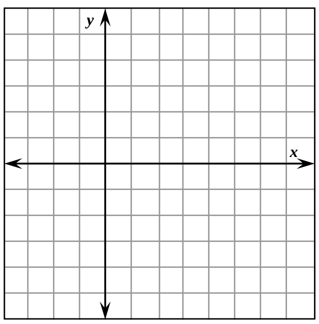
Hole:
VA:
Domain:
HA:
SA:
x-intercept:
y-intercept:

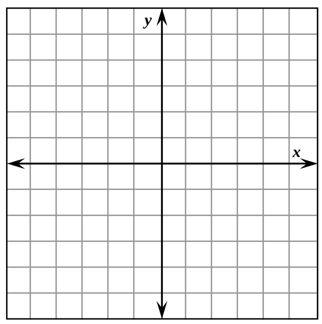
Piecewise Functions: Day 6 Notes

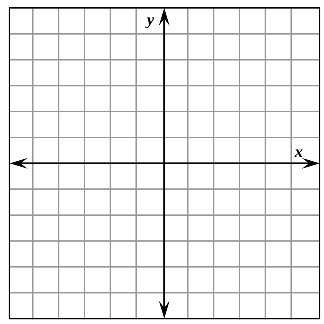
1. Piecewise Functions- A functions that is defined by two (or more) equations over a specified domain.

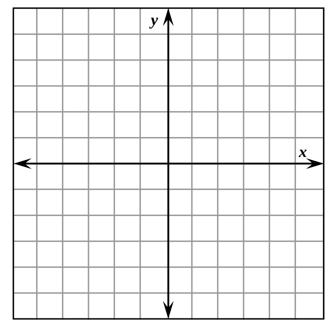
2. Graph each of the following, given the domain restrictions. List the domain and range in interval notation.

a. $y = -2x,\ x \geq -1$ b. $y = x^2,\ x < 0$ c. $y = |x| - 1,\ -1 < x < 1$ d. $y = [x+2],\ -2 \leq x \leq 2$









3. Evaluate each piecewise function at the given values of the independent variable.

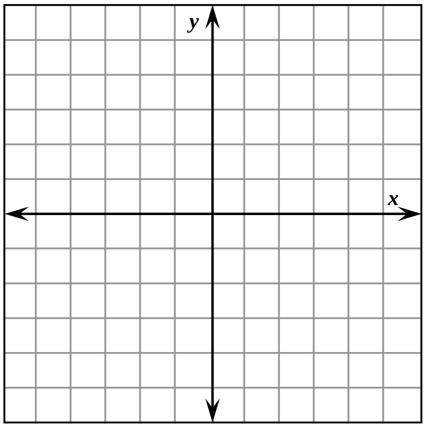
a. $g(x) = \begin{cases} 3x+5 & if\ x < 0 \\ 4x+7 & if\ x \geq 0 \end{cases}$ g(-2) = g(0) = g(3) =

b. $f(x) = \begin{cases} x^2+1 & if\ x \geq -3 \\ -(x+3) & if\ x < -3 \end{cases}$ f(0) = f(-6) = f(-3) =

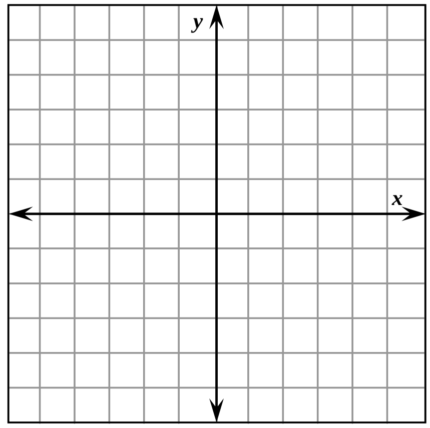
c. $h(x) = \begin{cases} \dfrac{x^2-9}{x-3} & if\ \ x \neq 3 \\ 6 & if\ \ x = 3 \end{cases}$ h(5) = h(0) = h(3) =

4. Sketch the graph of each function. Then list the domain and range in interval notation.

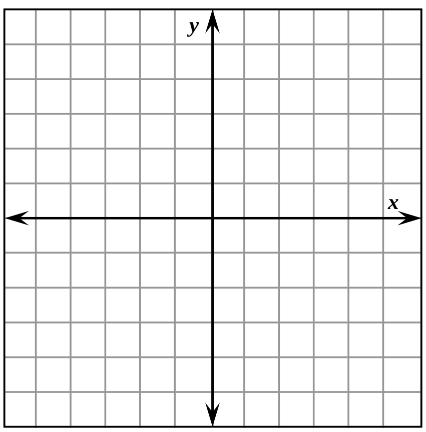
a. $h(x) = \begin{cases} x-1 & \text{if } x > 2 \\ -x-3 & \text{if } x \le 2 \end{cases}$



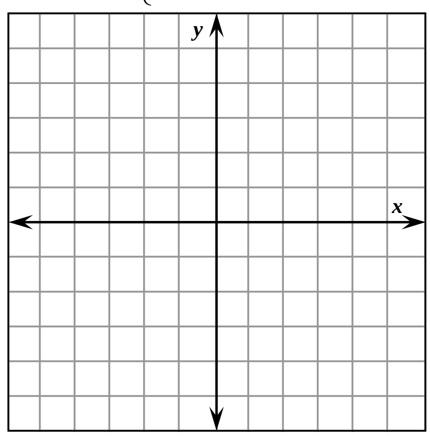
b. $g(x) = \begin{cases} -x & \text{if } x < 0 \\ x+1 & \text{if } x \ge 0 \end{cases}$



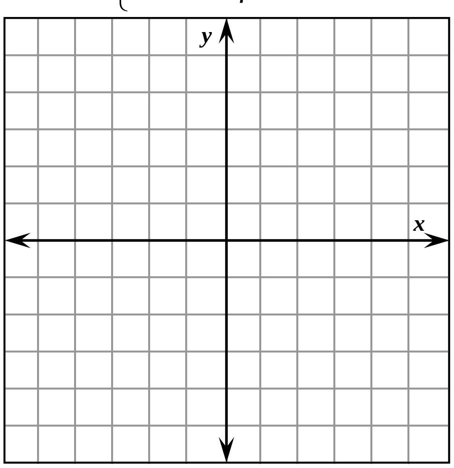
c. $h(x) = \begin{cases} |x+2| & \text{if } x > 1 \\ -x^2+3 & \text{if } x \le 1 \end{cases}$



d. $g(x) = \begin{cases} (x+4)^2 & \text{if } x \le -2 \\ 2 & \text{if } -2 < x < 0 \\ -x^2+2x & \text{if } x \ge 0 \end{cases}$



e. $f(x) = \begin{cases} x^2 & \text{if } x < -2 \\ x & \text{if } -2 \le x < 1 \\ x+2 & \text{if } x \ge 1 \end{cases}$

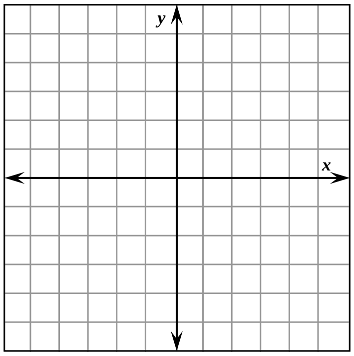


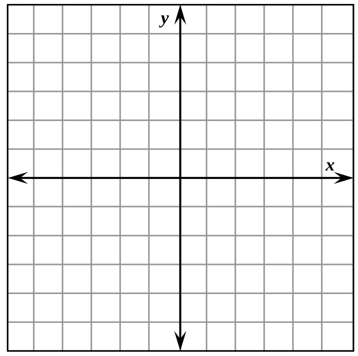
Piecewise Homework Worksheet 1

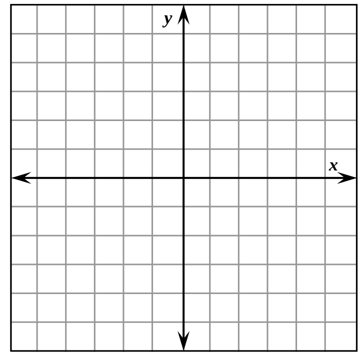
1. $f(x) = \begin{cases} x^2 & \textit{if} \quad x \le -1 \\ -2 & \textit{if} \ -1 < x < 1 \\ x+1 & \textit{if} \quad x \ge 1 \end{cases}$

2. $h(x) = \begin{cases} x^2 & \textit{if} \ x < 0 \\ x-1 & \textit{if} \ x \ge 0 \end{cases}$

3. $g(x) = \begin{cases} x^3 & \textit{if} \quad x \le -1 \\ -2 & \textit{if} \ -1 < x < 2 \\ \sqrt{x} & \textit{if} \quad x \ge 2 \end{cases}$



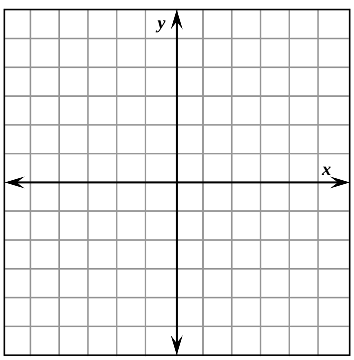


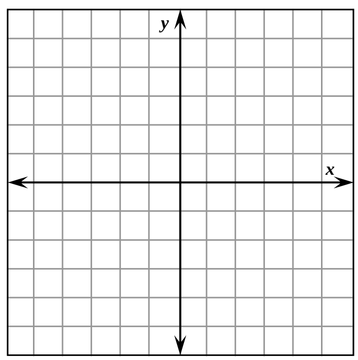


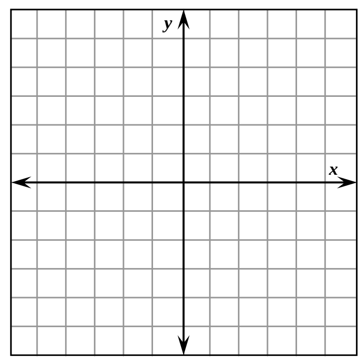
4. $h(x) = \begin{cases} x+3 & \textit{if} \quad x \le 0 \\ 2 & \textit{if} \ 0 < x < 1 \\ x^2 & \textit{if} \quad x \ge 1 \end{cases}$

5. $f(x) = \begin{cases} -1 & \textit{if} \ -3 \le x < -1 \\ 2 & \textit{if} \quad x = -1 \\ 3 & \textit{if} \quad x > -1 \end{cases}$

6. $p(x) = \begin{cases} x^2 & \textit{if} \quad x \ge 1 \\ x-1 & \textit{if} \ -3 \le x < 1 \\ 4 & \textit{if} \quad x < -3 \end{cases}$



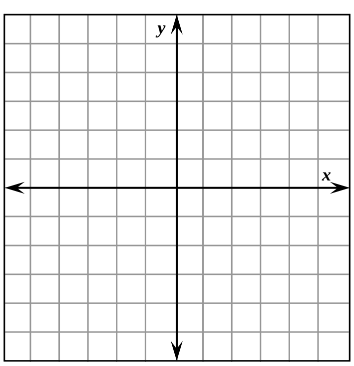


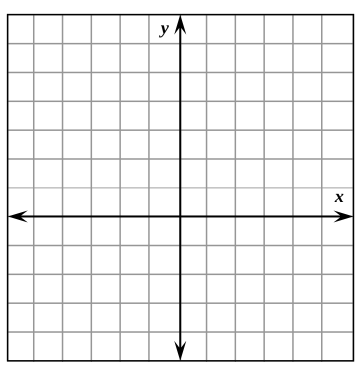


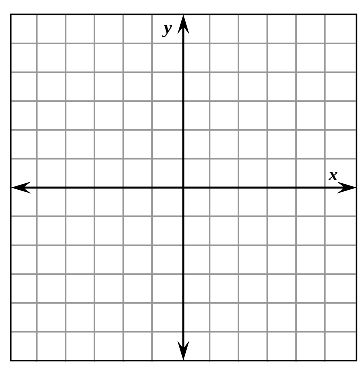
7. $g(x) = \begin{cases} 2 & \textit{if} \ x \textit{ is an odd } \mathrm{int} \\ x-1 & \textit{if} \ x \textit{ is an even } \mathrm{int} \end{cases}$

8. $f(x) = \begin{cases} x^2+3 & \textit{if} \ 1 < x < -2 \\ 3 & \textit{if} \quad x \ge 1 \\ -4 & \textit{if} \quad x \le -2 \end{cases}$

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



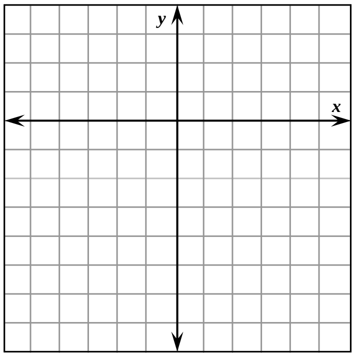


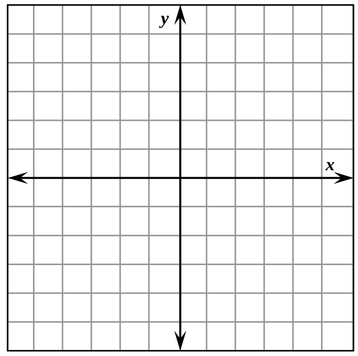


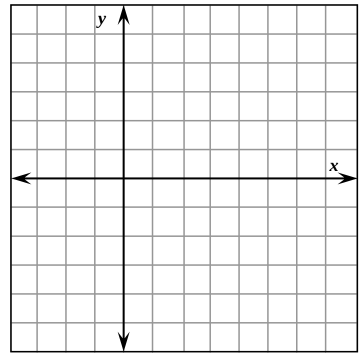
10. $f(x) = \begin{cases} \sqrt{x}; & x \ge 1 \\ x^2 - 3; & -2 \le x < 1 \\ 4x; & x < -2 \end{cases}$

11. $f(x) = \begin{cases} |x|; & x \ge -2 \\ -1; & x < -2 \end{cases}$

12. $f(x) = \begin{cases} \sqrt[3]{x}; & x \ge 1 \\ x^2; & x < 1 \end{cases}$







II. Evaluate.

13. $f(x) = \begin{cases} 5 - |x+3| & \text{if } x < 2 \\ [x] & \text{if } x \ge 2 \end{cases}$

a. $f(-2.1) =$

b. $f(11.8) =$

c. $f(-3.5) =$

14. $g(x) = \begin{cases} 2x^2; & x \le 2 \\ x - 5; & 2 < x \le 3 \\ \sqrt{x}; & x > 4 \end{cases}$

a. $g(-2) =$

b. $g(3) =$

c. $g(12) =$

Piecewise Application Notes

1. An amusement park charges $100 for groups of 10 or less people. For groups of more than 10 they charge the $100 fee plus an additional $4 per person. The park does not allow groups larger than 40.

   a. A group of 15 would pay: ____________ b. A group of 20 would pay: _______________

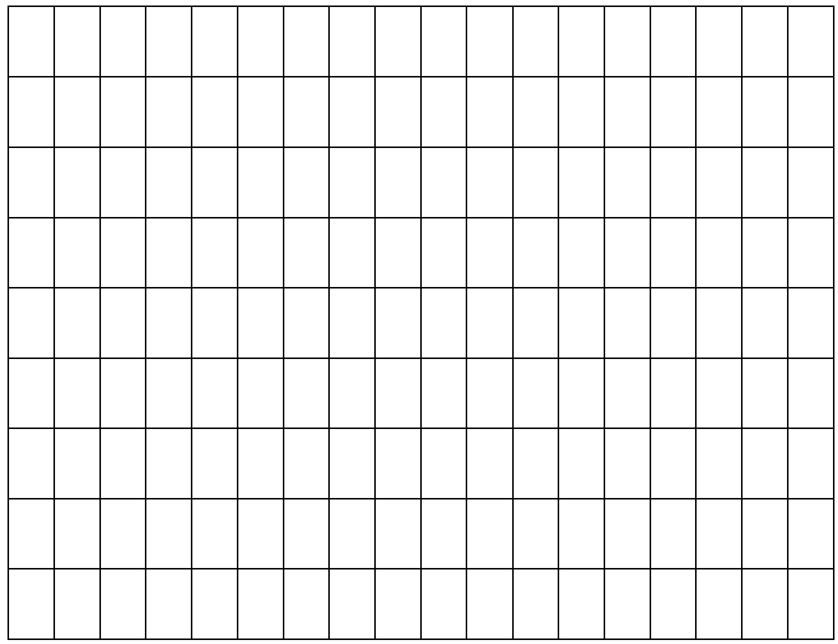
   Let x = _______________

   c. Write a function C = *f*(x), that represents the cost as a function of the number of people going to the amusement park.

   Graph the function:

   Label axes.

   $f(x) = \left\{ \right.$

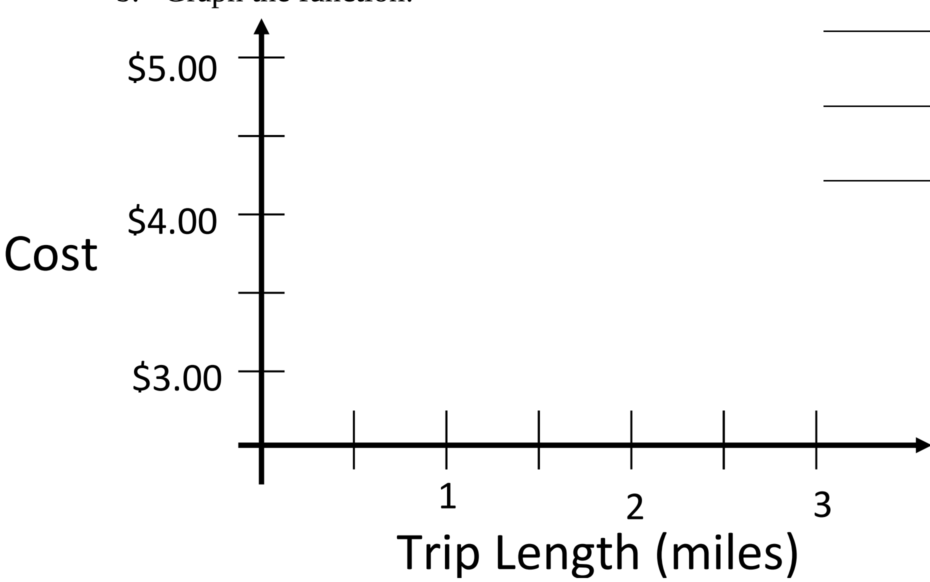


2. A taxi in Los Angeles costs $3.00 for the first half mile and then $0.50 for each additional half mile. The taxis round up to the next half-mile. (So someone on a 1.2 mile ride would be charged for 1.5 mile: $3.00 + 2 (.50) = $4.00)

   a. Finish the table

   b. Graph the function:

Length of Ride	Cost
$0 < x \le ½$	
$\_\_ < x \le 1$	$3.50
$1 < x \le \_\_\_$	
$\_\_\_ < x \le \_\_\_$	$4.50



3. A long distance telephone charges 99 cents for any call up to 20 minutes in length and 7 cents for each additional minute.

   a. Use bracket notation to write a formula for the cost, C, of a call as a function of its length time, t, in minutes.

   b. How much does it cost to talk for 10 minutes? ___________ 25 minutes? _____________

4. A company charges $200 a month to organize a company's payroll for up to 20 employees and an additional $100 a month for each 20 employees over 20. Find a function, P = *f*(x), that gives the payroll amount for 100 employees in one month.

5. An economy car costs $95 per week. Extra days cost $24 per day until the rate exceeds the weekly rate, in which case the weekly rate applies. Find the cost C of renting an economy car as a piecewise-defined function of the number x of days used, where $7 \leq x \leq 14$

Piecewise Application Worksheet

1. A museum charges \$40 for a group of 10 or fewer people. A group of more than 10 people must, in addition to the \$40, pay \$2 per person for the number of people above 10. For example, a group of 12 pays \$44 and a group of 15 pays \$50. The maximum group size is 50.

   a. Find a function, C = f(x), that represents the cost as a function of the number of people going to the museum.

   b. How much would the museum charge for a group of 8?

   c. Group with 35 people?

2. The charge for a taxi ride is \$1.50 for the first 1/8 of a mile, and \$0.25 for each additional 1/8 of a mile (rounded to the nearest 1/8 mile).

   a. Find a function, C = f(x), that represents the cost of the trip as a function of its length. Your domain should start at 0 and go up to one mile in 1/8 mile intervals.

   b. What is the cost for a 5/8 mile ride? ___________________

   c. How far can you go for \$3.00? __________________

3. A parking garage in Manhattan charges in this way: For each hour or part of an hour, the garage charges \$10 per hour, with a daily maximum of \$50 per day.

   a. How much will a customer pay if he/she parks for 2 hours? ________ 3.5 hours?____________

   b. 4 hours?____________

   c. Write a piecewise function that has as its input the number of hours parked and outputs the total price paid by the customer.

4. The minimum payment on a credit card is based on the total amount owed. A credit card company uses the following rules:

   For a bill less than \$10 the entire amount is due.
   For a bill of at least \$10 but less than \$500, the minimum due is \$10.
   There is a minimum of \$30 due on a bill of at least \$500 but less than \$1000,
   A minimum of \$50 due on a bill of a least \$1000, but less than \$1500, and
   A minimum of \$70 is due on bills \$1500 or more.

   Find the function F that describes the minimum payment on a bill of X dollars.

5. A paperback sells for \$12. The author is paid royalties of 10% on the first 10,000 copies sold, and 15% on any additional copies.
   a. When the 6,000th book is sold, how much will the author earn **on that sale?** _______________

   b. Also, what will the author's total royalties be at that point? _______________

   c. When the 12,000th book is sold, how much will the author earn **on that sale?** _______________

   d. Also, what will the author's total royalties be at that point? _______________

   e. Let x be the number of copies sold. Write a piecewise function for R (the total royalty earned) in terms of x.

   f. How many copies have to be sold in order for the author to have earned \$30,000? ________________

6. You are a buyer for a grocery store and you are asked to purchase potatoes for the grocery store. The distributor of potatoes tells you that if you buy up to 50 bushels of potatoes, you will pay \$40 per bushel; and for each bushel you purchase above 50 bushels, you will pay \$30 per bushel.

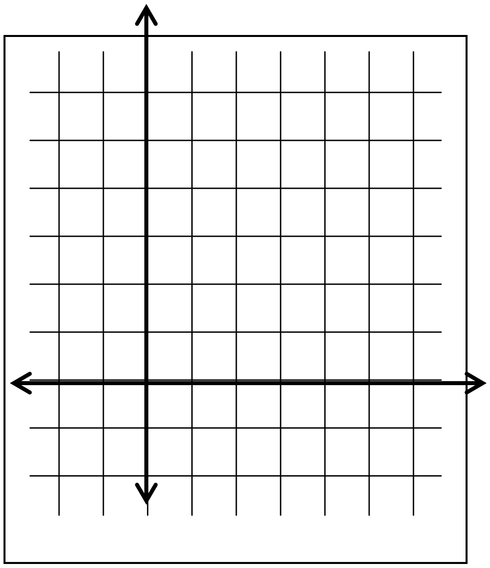
   a. How much will your grocery store pay in total if you decide to purchase 40 bushels?________

   b. 60 bushels? ________ 100 bushels___________?

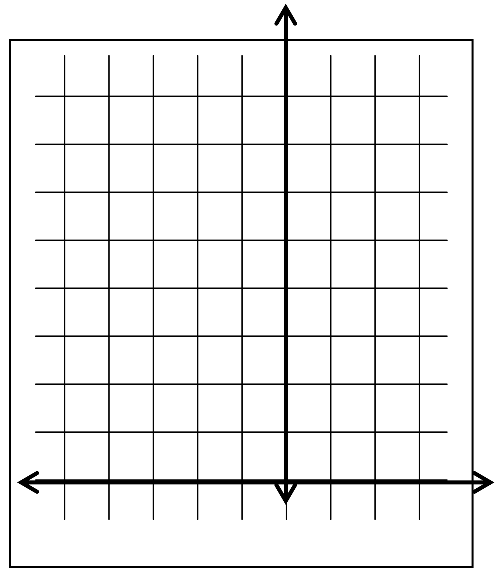
   c. Write a function which has as its input values (x-values) the number of bushels of potatoes purchased and outputs the total amount of money that your grocery store will pay for the potatoes.

AFM - - Unit 1 GRAPHING - - TEST REVIEW SHEET #1

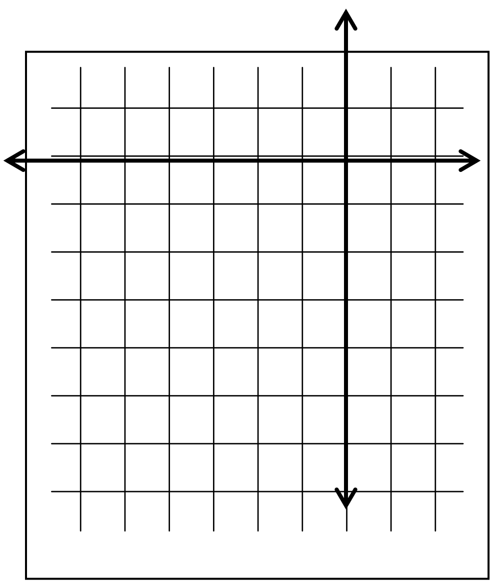
I. Graph1. $y = |x-1| + 1$



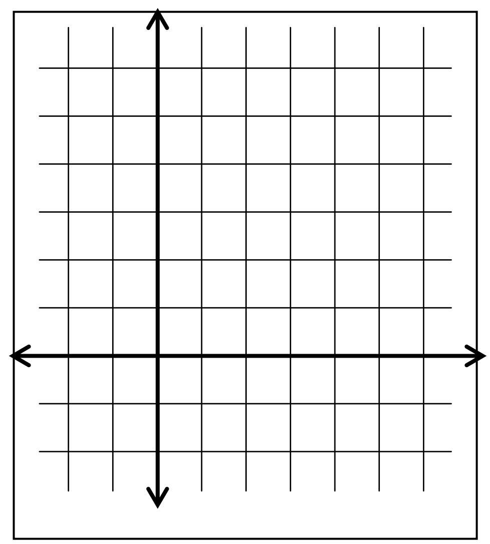
2. $y = 2\sqrt{x+2} + 3$



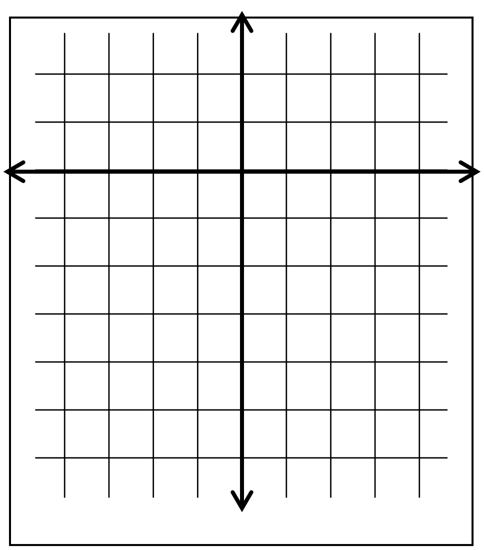
3. $y = (x+2)^2 - 4$



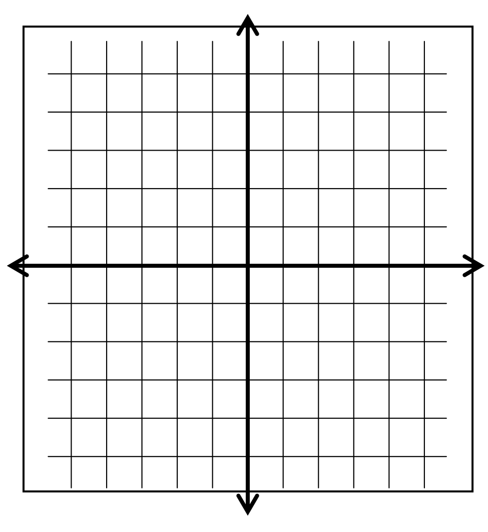
4. $y = \dfrac{1}{x-1} + 3$



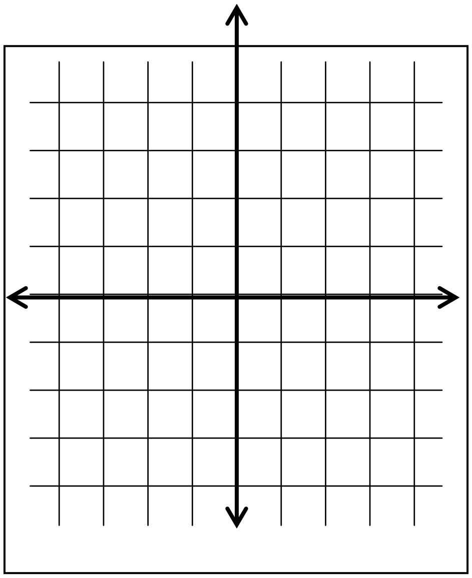
5. $y = [x] - 4$



6. $y = \dfrac{4}{(x-2)(x+3)}$



7. $y = \dfrac{x^2 + x - 6}{x + 3}$



II. Short Answer

8. Determine all of the asymptotes of $f(x) = \dfrac{-4}{x^2 + 4x + 3}$.

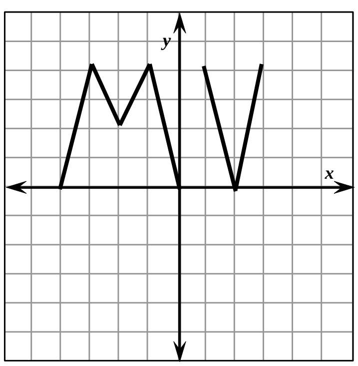
9. . Determine all of the asymptotes of $\boldsymbol{f(x) = \dfrac{x^2+6x+13}{x+2}}$.

10. Given the following, describe the transformations to their parent graph.

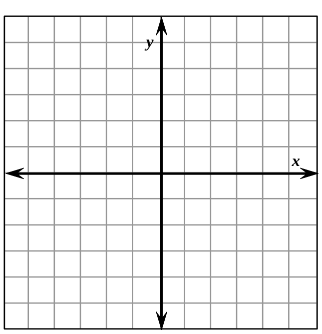
a. $y = [2x]$ **b.** $y = x^2 + 1$ **c.** $y = -3(x-1)^3 - 4$

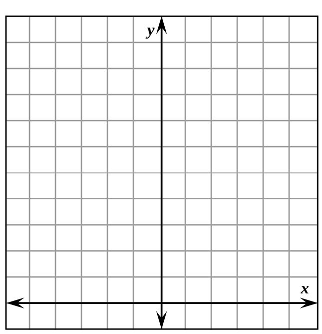
11. Given the following, graph each transformation.

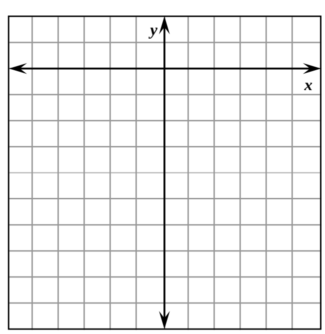
f(x) =

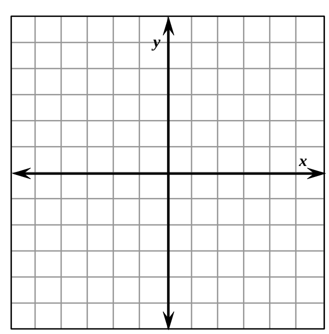


a. f(x – 2) b. 2f(x) + 1 c. -f(x) – 3 d. f(2x) – 1









AFM - - Unit 1 GRAPHING - - TEST REVIEW SHEET #2

I. Identify the parent graph and describe the transformation.

1. $f(x) = \sqrt{x+4}$

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

3. $y = x^2 + 2$

4. $y = \frac{1}{x+2}$

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

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

7. $y = -2|x-1| + 3$

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

II. What restrictions, if any, must be placed on the domain of each function?

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

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

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

4. $f(x) = -5$

5. $f(x) = 2x + 1$

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

7. $f(x) = \sqrt{x^2 - 1}$

8. $f(x) = \sqrt{16 - x}$

III. Write the equation for the graphs of the following functions.

1. $y = x^2$**; shift the graph up 5 units**

2. $y = \sqrt{x}$ **; shift the graph to the left 3 units**

3. $y = |x|$**; shrink vertically by 1/5**

4. $y = \frac{1}{x}$ **; shift the graph down 3 units**

5. $y = \sqrt{x}$ **; flip over the x-axis**

6. $y = x$ **; stretch vertically by 3**

7. $y = x^3$**; stretch horizontally by** $\frac{1}{2}$

8. $y = |x|$**; shift the graph up 4 units and left 5 units**

9. $y = x^2$**; shift the graph to the left 5 units and flip over the x-axis**

10. $y = x^2$; **shift the graph to the left 3 units and down 1 unit**

11. $y = x$; **stretch vertically by 2 and flip over the x-axis**

12. $y = |x|$; **shift the graph to the right 4 units and up 2 units**

13. $y = \sqrt{x}$; **shift the graph to the left 2 units, down 4 units, and flip over the x-axis**

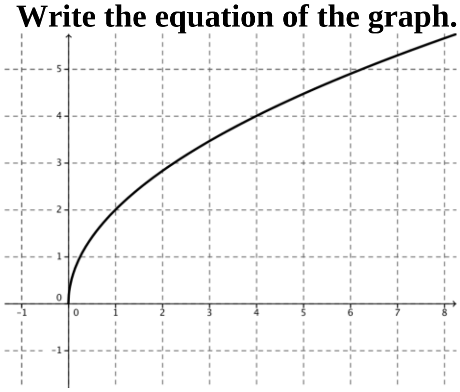
14. $y = \dfrac{1}{x}$; **shift the graph to the left 3 units and up 1 unit**

15. $y = x^3$; **shrink vertically by 1/4 and shift to the right 3 units**

16. $y = [x]$; **shift the graph to the right 6 units and up 2 units**

IV. Write the equation of the graph.

17.



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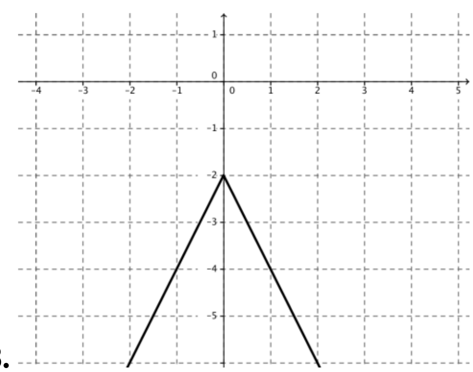

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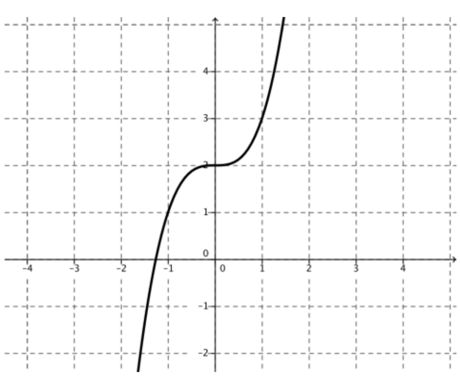

20.