NAME: ______________________________ PERIOD: _______

Algebra II
UNIT 4

Radical and Rational Functions

UNIT 4 – Graphing Radical and Rational Functions

WHAT ARE YOU LEARNING?

Henry County Graduate Learner Outcomes:

- As a Henry County graduate, I will be able to create, interpret, use, and analyze patterns of algebraic structures to make sense of problems.
- As a Henry County graduate, I will be able to use functions to interpret and analyze a variety of contexts.

Georgia Standards of Excellence:

Lesson 4-1 – Graphing Radical Functions

MGSE9-12.F.IF.7 Graph functions expressed algebraically and show key features of the graph both by hand and by using technology.

MGSE9-12.F.IF.7b Graph square root, cube root, and piecewise-defined functions, including step functions and absolute value functions.

Lesson 4-2 – Solving Radical Equations

MGSE9-12.A.REI.2 Solve simple rational and radical equations in one variable, and give examples showing how extraneous solutions may arise.

Lesson 4-3 – Graphing Rational Functions

MGSE9-12.F.IF.7d Graph rational functions, identifying zeros and asymptotes when suitable factorizations are available, and showing end behavior.

MGSE9-12.F.IF.4 Using tables, graphs, and verbal descriptions, interpret the key characteristics of a function which models the relationship between two quantities. Sketch a graph showing key features.

MGSE9-12.F.IF.5 Relate the domain of a function to its graph and, where applicable, to the quantitative relationship it describes.

Lesson 4-4 – Simplifying, Multiplying, and Dividing Rational Expressions
Lesson 4-5 – Adding and Subtracting Rational Expressions

MGSE9-12.A.APR.7 Understand that rational expressions form a system analogous to the rational numbers, closed under addition, subtraction, multiplication, and division by a nonzero rational expression; add, subtract, multiply, and divide rational expressions.

Lesson 4-6 – Solving Rational Equations

MGSE9-12.A.REI.2 Solve simple rational and radical equations in one variable, and give examples showing how extraneous solutions may arise.

MGSE9-12.A.CED.1 Create equations and inequalities in one variable and use them to solve problems. Include equations arising from simple rational functions.

UNIT 4 – Graphing Radical and Rational Functions

WHY ARE YOU LEARNING THIS?

Level 3 Performance Task:

Students will create their own rational equation and identify all characteristics studied in this unit.

WHAT IS YOUR GOAL FOR THIS UNIT?

Unit Goal:

I scored a _________ on my pretest.

My goal is to score a _________ or higher on the end of unit test.

To achieve this goal I will ____

____

____

HOW WILL YOU KNOW WHEN YOU'VE MASTERED THIS? SHOW ME THE EVIDENCE!

Data Analysis: **Pre-Test Score** ______________ **Post-Test Score** ______________

Learning Targets:	Pre-Test Score	Quiz Score	Post-Test Score
R1: I can graph square root functions and identify characteristics of the graph. (F.IF.7b)			
R2: I can graph cube root functions and identify characteristics of the graph.. (F.IF.7b)			
R3: I can solve simple radical equations. (A.REI.2)			
~~R4: I can solve simple radical inequalities. (A.CED.1)~~	____	____	____
R8: I can graph rational functions. (F.IF.7d, F.IF.4, F.IF. 5)			
R9: I can identify characteristics of a rational function. (F.IF.7d, F.IF.4, F.IF.5)			
R5: I can simplify, multiply, and divide rational expressions. (A.APR.7)			
R6: I can add and subtract rational expressions. (A.APR.7)			
R7: I can solve simple rational equations. (A.REI.2)			

UNIT 4 – Graphing Radical and Rational Functions

LEARNING ACTIVITIES

Lesson 4-1 – Graphing Radical Functions

R1: I can graph square root functions and identify characteristics of the graph.. (F.IF.7b)
R2: I can graph cube root functions and identify characteristics of the graph.. (F.IF.7b)

______ Complete guided notes with teacher **OR** Watch video lesson and take notes
______ Complete 4-1 practice

Lesson 4-2 – Solving Radical Equations

R3: I can solve simple radical equations. (A.REI.2)
~~R4: I can solve simple radical inequalities. (A.CED.1)~~

______ Complete guided notes with teacher **OR** Watch video lesson and take notes
______ Complete 4-2 practice

Lesson 4-3 – Graphing Rational Functions

R8: I can graph rational functions. (F.IF.7d, F.IF.4, F.IF. 5)
R9: I can identify characteristics of a rational function. (F.IF.7d, F.IF.4, F.IF.5)

______ Complete guided notes with teacher **OR** Watch video lesson and take notes
______ Complete 4-3 practice

Lesson 4-4 – Simplifying, Multiplying, and Dividing Rational Expressions

R5: I can simplify, multiply, and divide rational expressions. (A.APR.7)

______ Complete guided notes with teacher **OR** Watch video lesson and take notes
______ Complete 4-4 practice

Lesson 4-5 – Adding and Subtracting Rational Expressions

R6: I can add and subtract rational expressions. (A.APR.7)

______ Complete guided notes with teacher **OR** Watch video lesson and take notes
______ Complete 4-5 practice

Lesson 4-6 – Solving Rational Equations

R7: I can solve simple rational equations. (A.REI.2)

______ Complete guided notes with teacher **OR** Watch video lesson and take notes
______ Complete 4-6 practice

UNIT 4 Assessments

______ Complete Unit 4 Performance Task
______ Complete Unit 4 Review Guide
______ Complete Unit 4 Test
______ Complete Unit 4 Reflection

Lesson 4-1: Graphs of Radical Functions

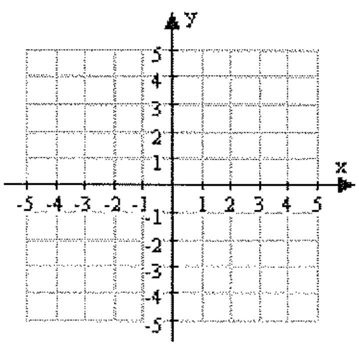
Learning Target: R1: ______________________________

R2: ______________________________

Consider the following EQUATIONS, make a table, plot the points, and graph what you think the graph looks like.

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

x	y
−4	
−1	
0	
1	
2	
3	
4	

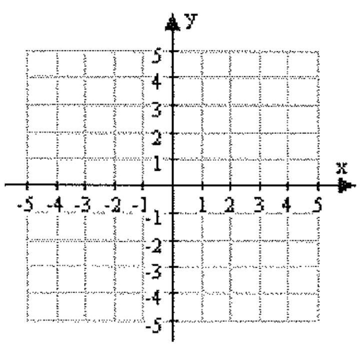


Domain:

Range:

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

x	y
−4	
−1	
0	
1	
2	
3	
4	

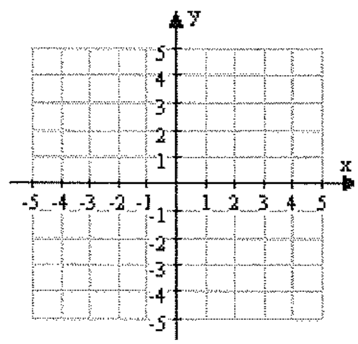


Domain:

Range:

3. $f(x) = 0.5\sqrt{x}$

x	y
−4	
−1	
0	
1	
2	
3	
4	

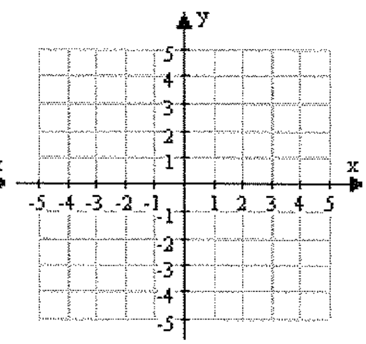


Domain:

Range:

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

x	y
−4	
−1	
0	
1	
2	
3	
4	



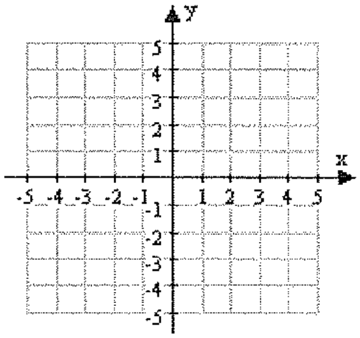
Domain:

Range:

5. What happens to the graph as the number in front of $\sqrt{x}$ gets Larger? Close to Zero? Negative?

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

x	y
−4	
−3	
−2	
−1	
0	
1	
4	

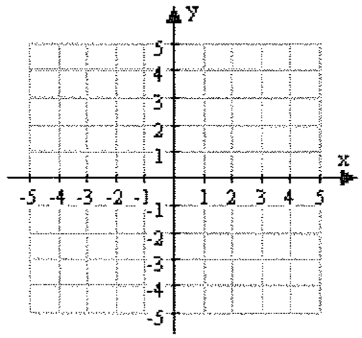


Domain:

Range:

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

x	y
−5	
−4	
−3	
−2	
0	
3	
5	

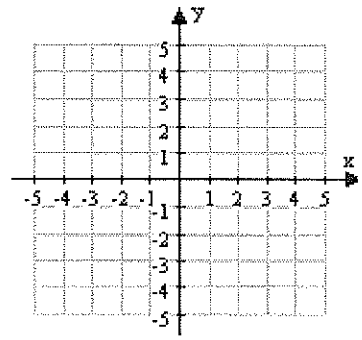


Domain:

Range:

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

x	y
−3	
0	
1	
2	
3	
4	
5	

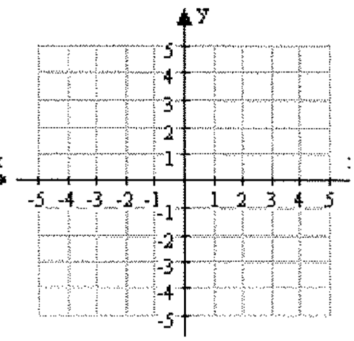


Domain:

Range:

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

x	y
−5	
−4	
−3	
−2	
0	
3	
5	

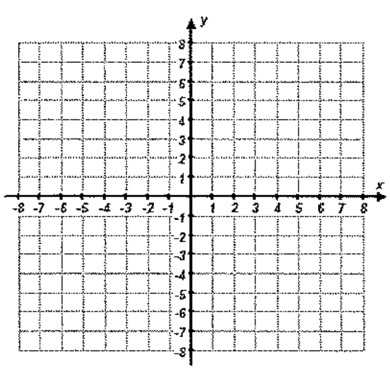


Domain:

Range:

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

x	y
−8	
−4	
−1	
0	
1	
4	
8	

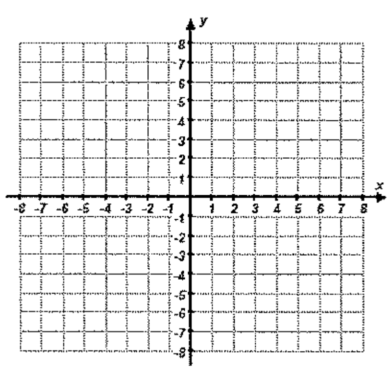


Domain:

Range:

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

x	y
−8	
−4	
−1	
0	
1	
4	
8	

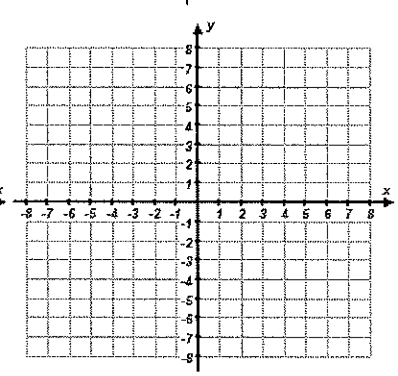


Domain:

Range:

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

x	y
−8	
−4	
−3	
−2	
1	
5	
8	

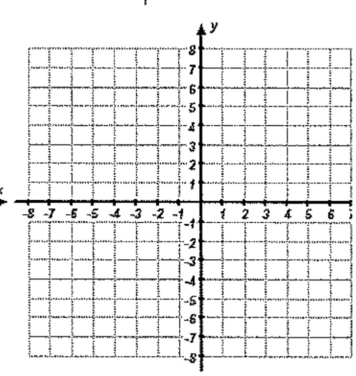


Domain:

Range:

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

x	y
−8	
−4	
−3	
−2	
1	
5	
8	



Domain:

Range:

Take Aways… What did you notice?

Positive Square Roots:

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

D: [0, ∞)
R: [0, ∞)

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

D: [–3, ∞)
R: [0, ∞)

f(x) = $4\sqrt{x} - 5$

D: [0, ∞)
R: [–5, ∞)

Rule: **Domain →**

Range →

Negative Square Roots:

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

D: [0, ∞)
R: (–∞, 0]

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

D: [–3, ∞)
R: (–∞, 0]

f(x) = $-4\sqrt{x} - 5$

D: [0, ∞)
R: (–∞, –5]

Rule: **Domain →**

Range →

Cubed Roots:

Rule: **Domain →** (–∞, ∞)

Range → (–∞, ∞)

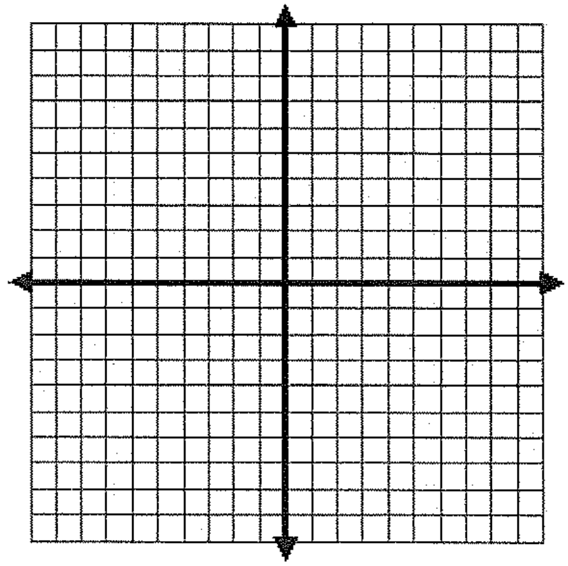
You Try:

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

x	f(x)
-4	
-3	
-2	
-1	
0	
1	
2	
3	
4	

Domain:

Range:

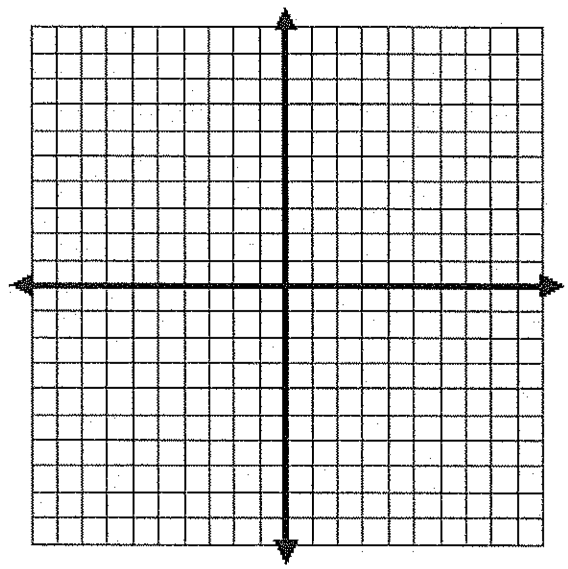


2. $f(x) = 4\sqrt{x+3}$

x	f(x)
-4	
-3	
-2	
-1	
0	
1	
2	
3	
4	

Domain:

Range:

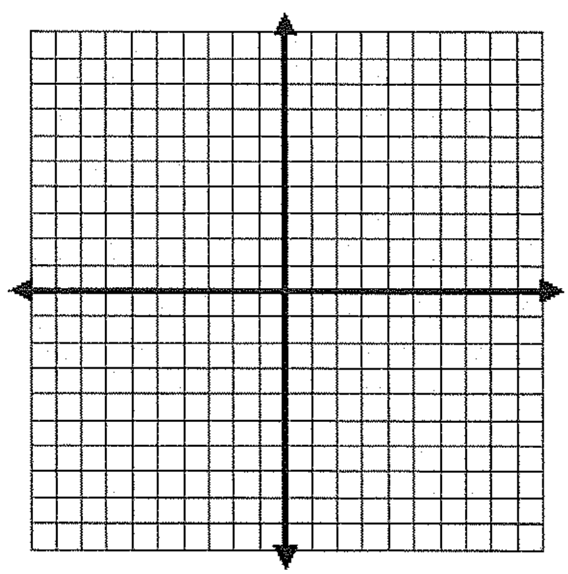


3. $f(x) = 4\sqrt{x} - 5$

x	f(x)
-1	
0	
1	
2	
3	
4	
5	
6	

Domain:

Range:

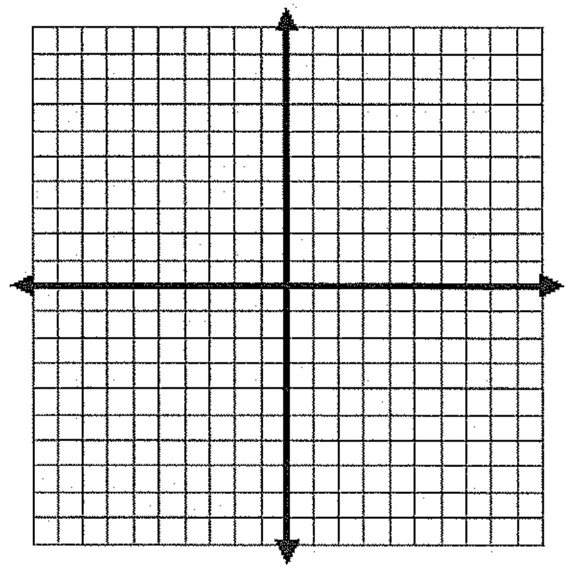


4. $f(x) = -2\sqrt{x+3} + 5$

x	f(x)
-4	
-3	
-2	
-1	
0	
1	
2	
3	
4	

Domain:

Range:

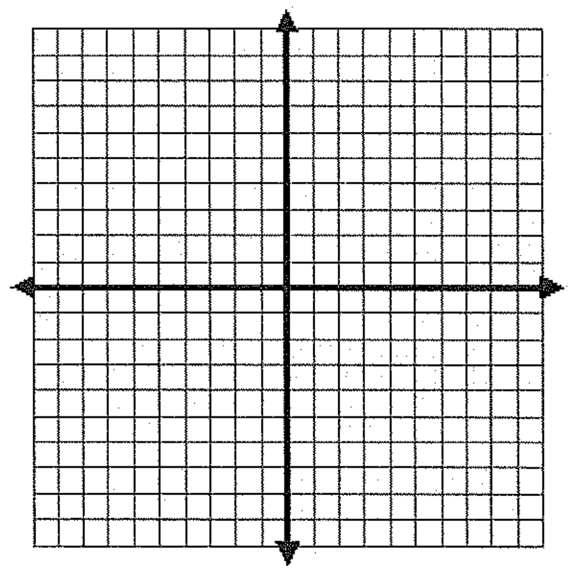


5. $f(x) = \sqrt[3]{x-1} + 4$

x	f(x)
-4	
-3	
-2	
-1	
0	
1	
2	
3	
4	

Domain:

Range:

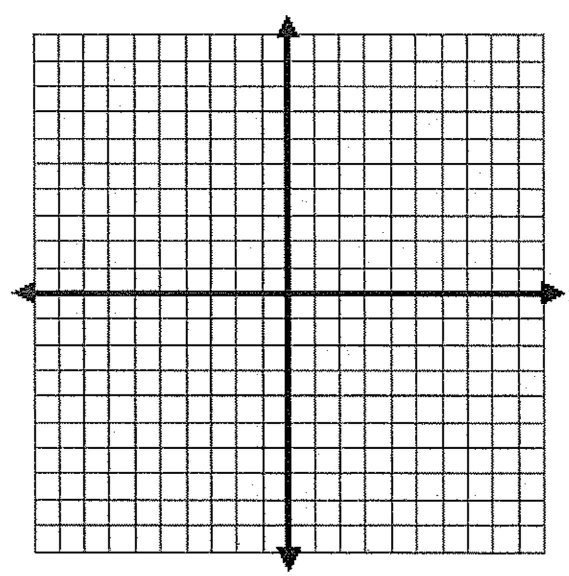


6. $f(x) = 3\sqrt[3]{x}$.

x	f(x)
-4	
-3	
-2	
-1	
0	
1	
2	
3	
4	

Domain:

Range:

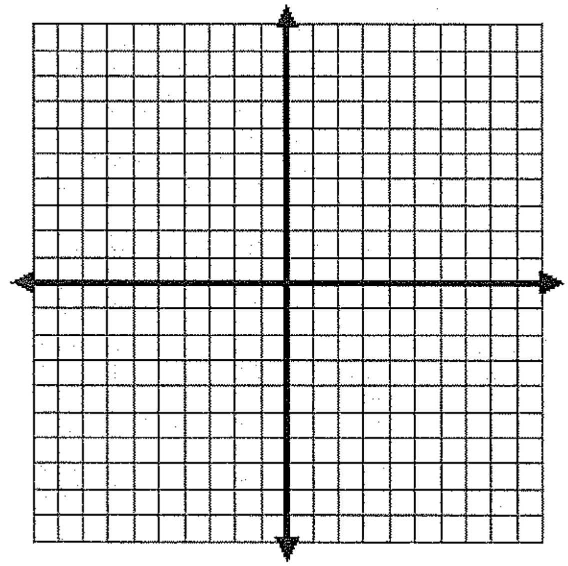


7. $f(x) = 3\sqrt[3]{x} + 2$

x	f(x)
-4	
-3	
-2	
-1	
0	
1	
2	
3	
4	

Domain:

Range:

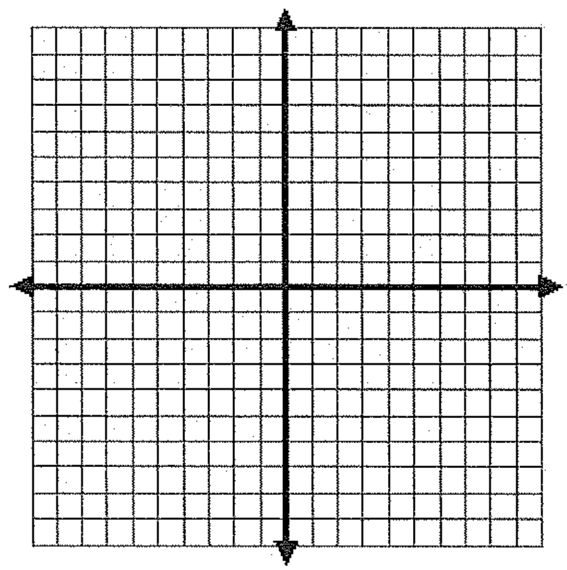


8. $f(x) = 3\sqrt[3]{x - 2}$

x	f(x)
-4	
-3	
-2	
-1	
0	
1	
2	
3	
4	

Domain:

Range:

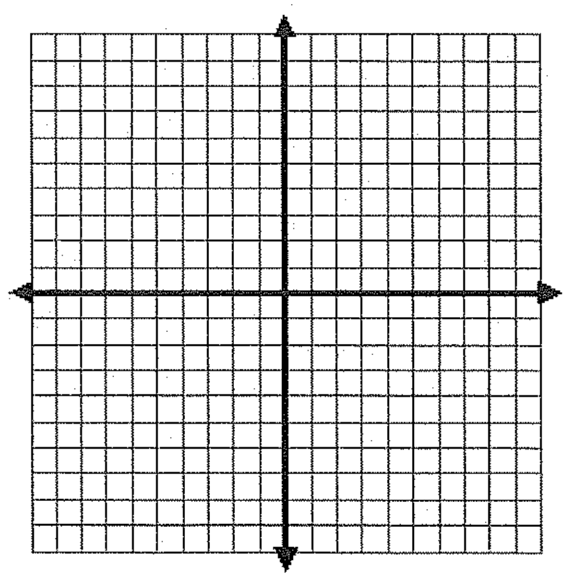


9. $f(x) = -\sqrt[3]{x - 1} + 4$

x	f(x)
-4	
-3	
-2	
-1	
0	
1	
2	
3	
4	

Domain:

Range:



Lesson 4-2: Solving Radical Equations and Inequalities

Learning Target: R3: ____________________

R4: ____________________

Find the value for the variable that makes the statement true. (SHOW WORK NEATLY)

1. $8\sqrt{2x+3}-10=30$

2. $2\sqrt{x+4}+9=1$

3. $3\sqrt{4a}-5=13$

4. $12=2\sqrt{2(x+1)-4}$

5. $\sqrt[3]{2x+1}+2=5$

6. $\sqrt[3]{2x}-10=-6$

One Radical Basic

I. Isolate the Radical if possible.

Example

$$3\sqrt{x+2}+4=19$$
$$-4 \quad -4$$
$$\frac{3\sqrt{x+2}}{3}=\frac{15}{3}$$
$$\sqrt{x+2}=5$$

II. Square Both Sides

Example

$$\left(\sqrt{x+2}\right)^2=(5)^2$$
$$x+2=25$$

III. Isolate the Variable

Example

$$x+2=25$$
$$-2 \quad -2$$
$$x=23$$

IV. Must Verify the Solution
(This is not optional some solutions are extraneous.)

Example

$$3\sqrt{(23)+2}+4=19$$
$$3\sqrt{25}+4=19$$
$$3(5)+4=19$$
$$15+4=19$$
$$19=19 \checkmark$$

Find the value for the variable that makes the statement true. (SHOW WORK NEATLY)

7. $\sqrt{5x+2}=\sqrt{3x+12}$

8. $2\sqrt{x-5}=\sqrt{3x+2}$

9. $2\sqrt{5x-4}=3\sqrt{x+8}$

10. $2\sqrt[3]{5x-3}=\sqrt[3]{35x+6}$

11. $x+3=\sqrt{15+x}$

Two Radical Basic Equation

I. Square Both Sides

Example

$\sqrt{5x+2}=3\sqrt{x-2}$

$\left(\sqrt{5x+2}\right)^2=\left(3\sqrt{x-2}\right)^2$

$5x+2=9(x-2)$

II. Eliminate Parenthesis

Example

$5x+2=9(x-2)$

$5x+2=9x-18$

III. Move variables to one side and constants to the other

Example

$5x+2=9x-18$

$-5x \quad -5x$

$2=4x-18$

$+18 \quad +18$

$20=4x$

IV. Divide both sides by the coefficient

Example

$\frac{20}{4}=\frac{4x}{4}$

$5=x$

V. Must Verify the Solution

(This is not optional some solutions are extraneous.)

Example

$\sqrt{5(5)+2}=3\sqrt{(5)-2}$

$\sqrt{25+2}=3\sqrt{3}$

$\sqrt{27}=3\sqrt{3}$

$3\sqrt{3}=3\sqrt{3}$ ✓

Find the value for the variable that makes the statement true. (SHOW WORK NEATLY)

12. $x-1=\sqrt{5x-9}$

13. $2x+1=\sqrt{11-2x}$

You Try: Be sure to check each solution.

1. $\sqrt{4+3x}=10$

2. $\sqrt{2x+1}=7$

3. $\sqrt[3]{4x-1}=3$

4. $\sqrt[3]{8x+3}-5=-2$

5. $\sqrt[3]{2x+4}=2\sqrt[3]{3-x}$

6. $\sqrt{7x-8}=\sqrt{5x}$

7. $\sqrt{3x+5}=\sqrt{x+15}$

8. $\sqrt[3]{2x+16}=\sqrt[3]{6x+8}$

9. $\sqrt{3x+1}+7=3$

Unit 4 – QUIZ REVIEW –Radicals Functions **Name: ________________________**

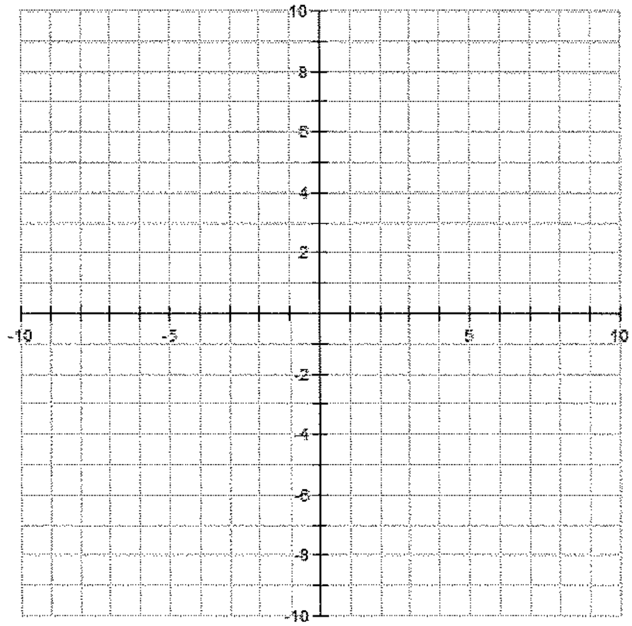
Graph the following and identify the domain and range for each:

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

x	y
1	
2	
3	
4	
7	
10	

Domain: ________________

Range: ________________

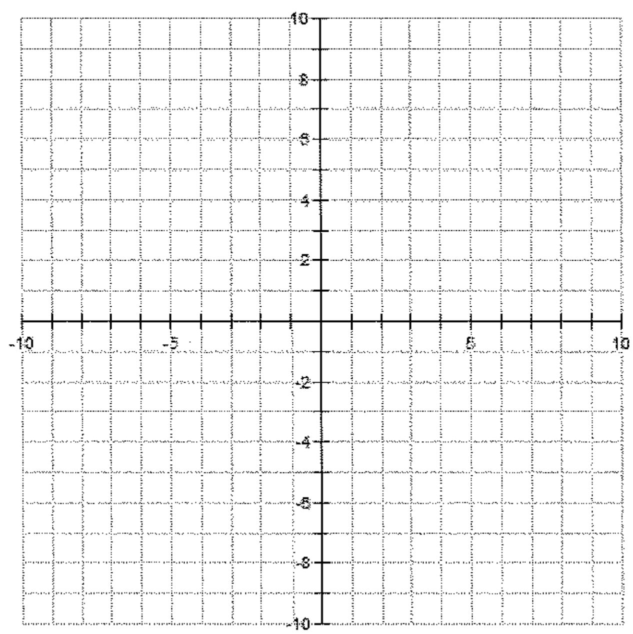


2. $f(x) = -3\sqrt{x+1}$

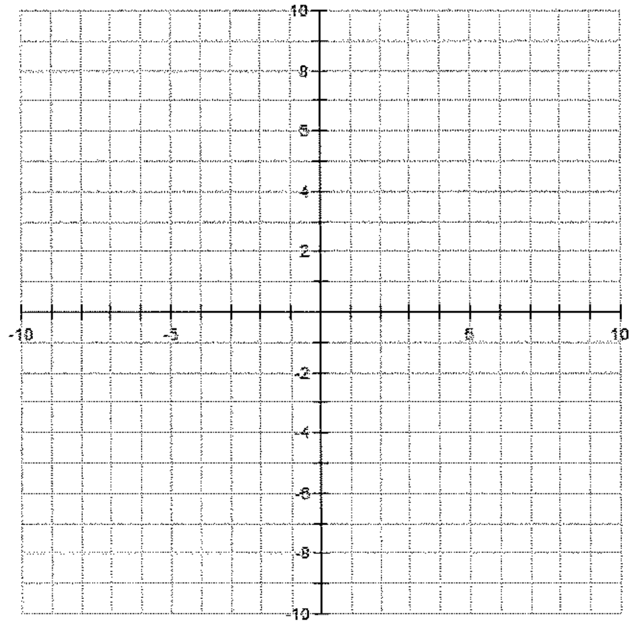
x	y
-3	
-2	
-1	
0	
3	
8	

Domain: ________________

Range: ________________



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

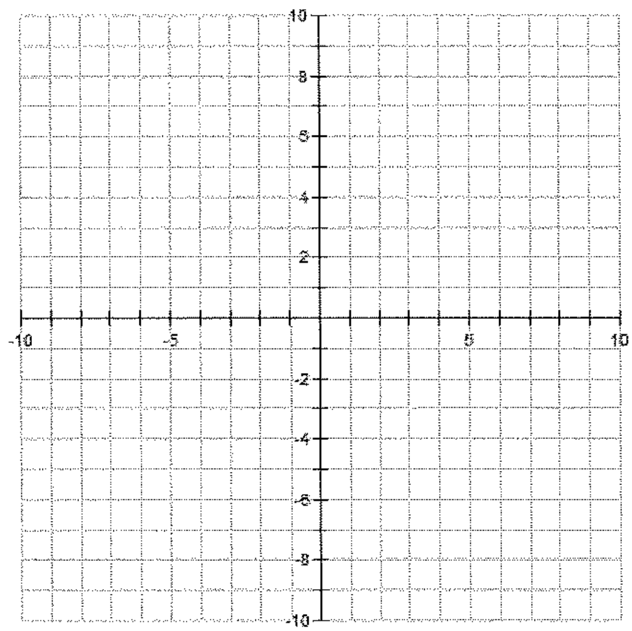


x	y
-10	
-6	
-3	
-2	
-1	
3	
6	
10	

Domain: ____________________

Range: ____________________

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



x	y
-10	
-6	
-2	
1	
2	
3	
6	
10	

Domain: ____________________

Range: ____________________

Identify the domain and range algebraically:

5. $f(x) = \sqrt{x-18} + 4$

Domain: ____________________

Range: ____________________

6. $f(x) = \sqrt[3]{x-8} + 7$

Domain: ____________________

Range: ____________________

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

Domain: ____________________

Range: ____________________

8. $f(x) = \sqrt[3]{x+3} - 11$

Domain: ____________________

Range: ____________________

Solve each of the following equations. Show organized work to support your answers. Be sure to check for extraneous solutions.

17. $\sqrt{v+4}-3=8$

18. $\sqrt{4n}=\sqrt{6x-4}$

19. $\sqrt{2x+15}=\sqrt{5x-9}$

20. $\sqrt{p+8}=1$

21. $\sqrt[4]{3x+2} = \sqrt[4]{2x+7}$

22. $\sqrt[3]{2x+1}=\sqrt[3]{10}$

23. $2\sqrt{x+5}+11=1$

24. $\sqrt[3]{3x+5}+3=6$

25. $4\sqrt{2x+3}-6=22$

26. $2\sqrt[3]{1-4x}+5=7$

Lesson 4-3: Graphing Rational Expressions

Learning Target: R8: ____

R9: ____

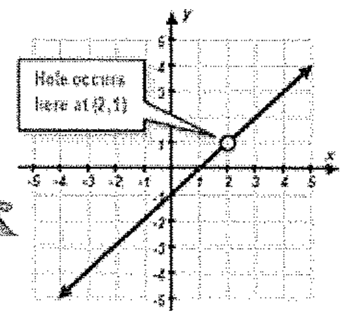
____

<table>
<tr><th>Characteristic</th><th>Description</th><th>Example</th></tr>
<tr>
<td>Hole
(Point Discontinuity)</td>
<td>A hole usually occurs in the graph of a rational function when a linear factor in the numerator and denominator "divide out". The result is the same as the graph of the simplified function but with a missing point in the graph.</td>
<td>

Graph: $f(x) = \frac{x^2-3x+2}{x-2}$

Simplifies: $f(x) = \frac{(x-2)(x-1)}{(x-2)}$

This will create a hole at $x = 2$.



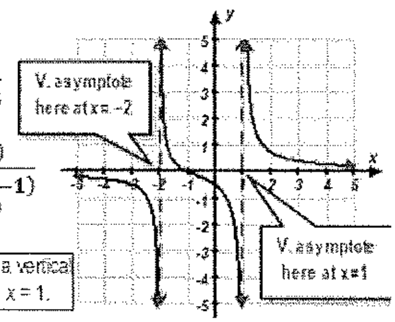
</td>
</tr>
<tr>
<td>Vertical Asymptote
(Infinite Discontinuity)</td>
<td>A vertical asymptote occurs any time a linear factor of the denominator doesn't "divide out" with a factor in the numerator.</td>
<td>

Graph: $f(x) = \frac{x+1}{x^2+x-2}$

Simplifies: $f(x) = \frac{(x+1)}{(x+2)(x-1)}$

This will create a vertical asymptote at $x = -2$.

This will create a vertical asymptote at $x = 1$.



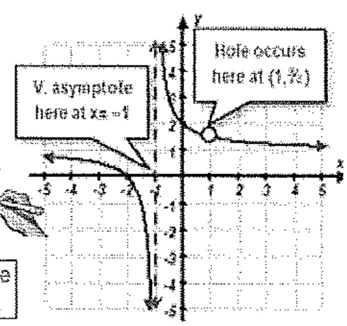
</td>
</tr>
<tr>
<td>Vertical Asymptote & Hole</td>
<td>To have both a hole and a vertical asymptote the rational function must have at least one linear factor that divides out and one linear factor that does not.</td>
<td>

Graph: $f(x) = \frac{x^2+x-2}{x^2-1}$

Simplifies: $f(x) = \frac{(x+2)(x-1)}{(x+1)(x-1)}$

This will create a vertical asymptote at $x = -1$.

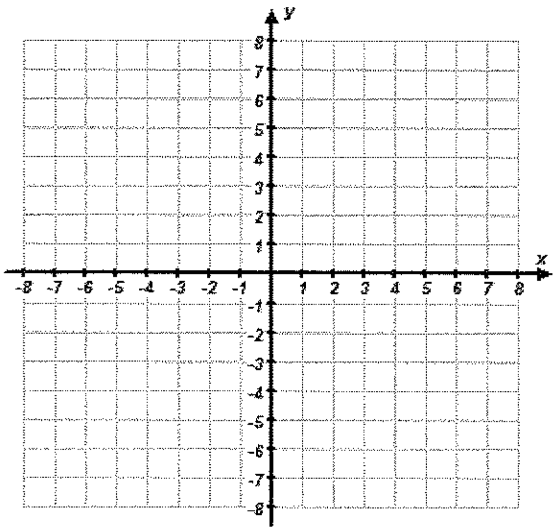
This will create hole at $x = 1$.



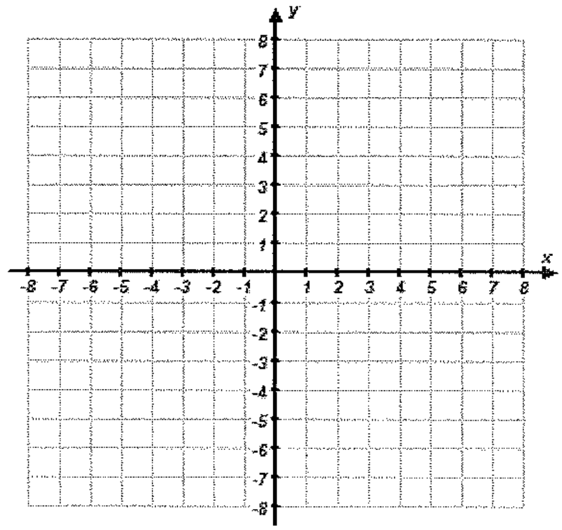
</td>
</tr>
</table>

Sketch a graph of the following rational functions. Label any holes or vertical asymptotes. Use your calculator for additional assistance.

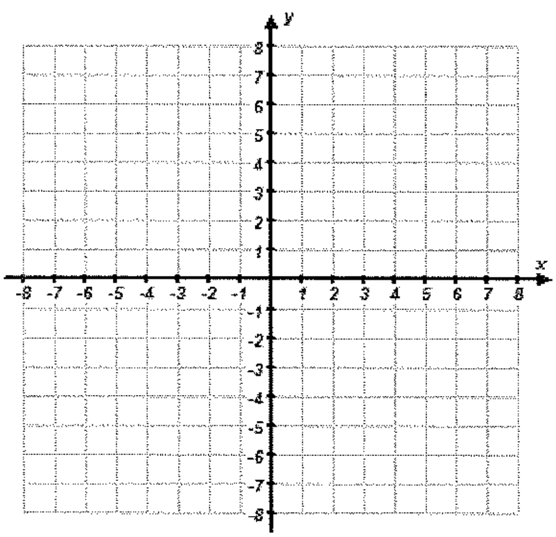
1. $f(x) = \frac{x^2+2x-3}{x-1}$



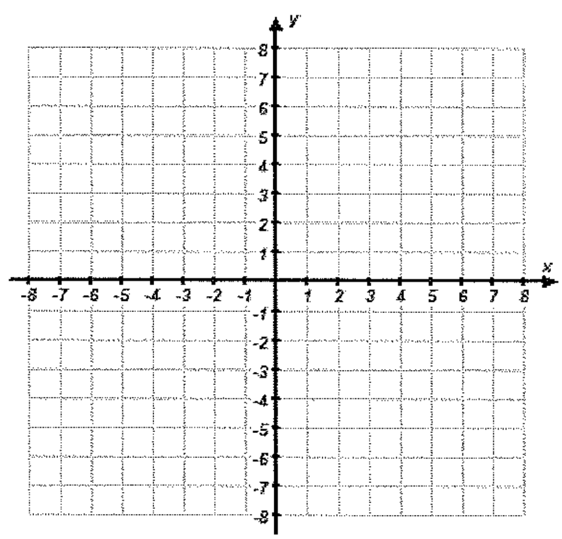
2. $f(x) = \frac{x^2+3x-4}{x^2+2x-8}$

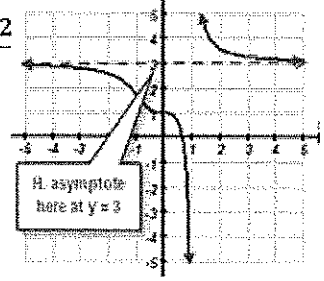
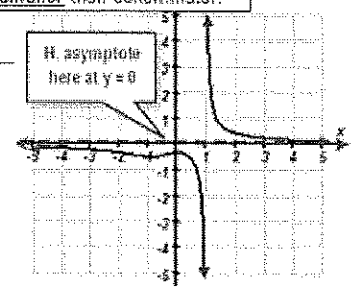
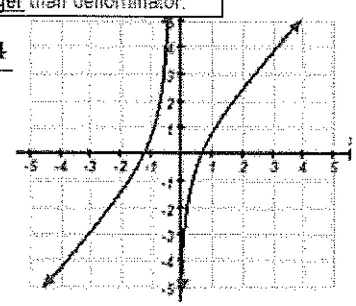


3. $f(x) = \frac{x^2+x-6}{x+3}$



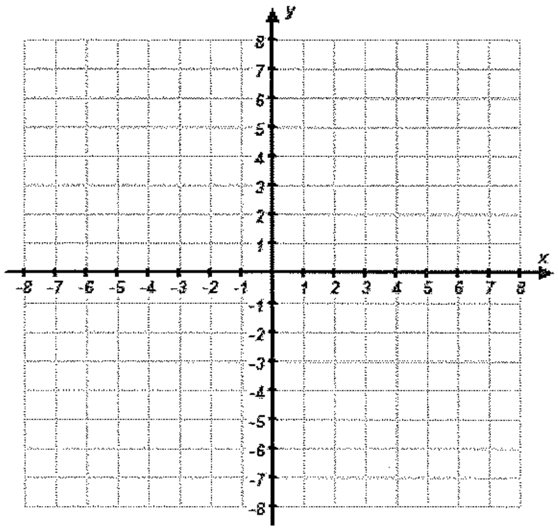
4. $f(x) = \frac{x^2-4}{x^2+6x+8}$



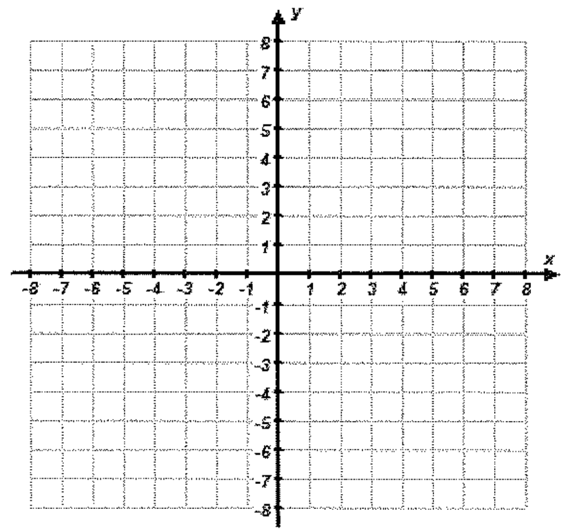
Potential Horizontal Asymptotes	Description	Example
Case #1:	A rational function that has a numerator polynomial with the **<u>same degree</u>** as the polynomial in the denominator creates a horizontal asymptote that passes through the y-axis at the quotient of the leading coefficients.	The degree of the numerator & denominator are the <u>same</u> **Graph:** $f(x) = \frac{6x^{③} + x^2 - 2}{2x^{③} - 2}$ **Analyze:** $f(x) = \frac{⑥x^3 + x^2 - 2}{②x^3 - 2}$ **Asymptote:** $y = \frac{6}{2}$ **or** $y = 3$ 
Case #2:	A rational function that has a polynomial in the **<u>numerator that has a smaller degree</u>** than the degree of the polynomial in the denominator creates a horizontal asymptote at y =0.	The degree of the <u>numerator is smaller</u> than denominator. **Graph:** $f(x) = \frac{2x^{②} + 1}{3x^{③} - 3}$ **Asymptote:** $y = 0$ 
Case #3:	A rational function that has a polynomial in the **<u>numerator that has a larger degree</u>** than the degree of the polynomial in the denominator does not have a horizontal asymptote.	The degree of the <u>numerator is larger</u> than denominator. **Graph:** $f(x) = \frac{5x^{②} + 3x - 4}{4x^{①} + 1}$ **Asymptote:** **No Horizontal Asymptote** 

Sketch a graph of the following rational functions. Label any vertical asymptotes, horizontal asymptotes, or holes. Use your calculator for additional assistance.

5. $f(x) = \frac{x-4}{x^2-2x-8}$

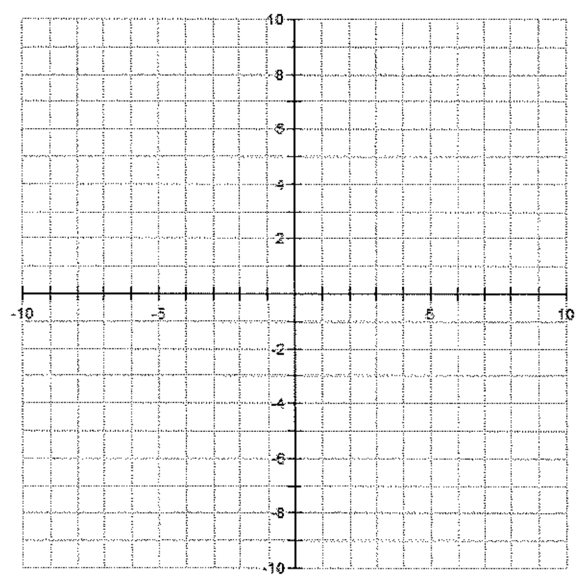


6. $f(x) = \frac{2x^2-8}{x^2+x-6}$



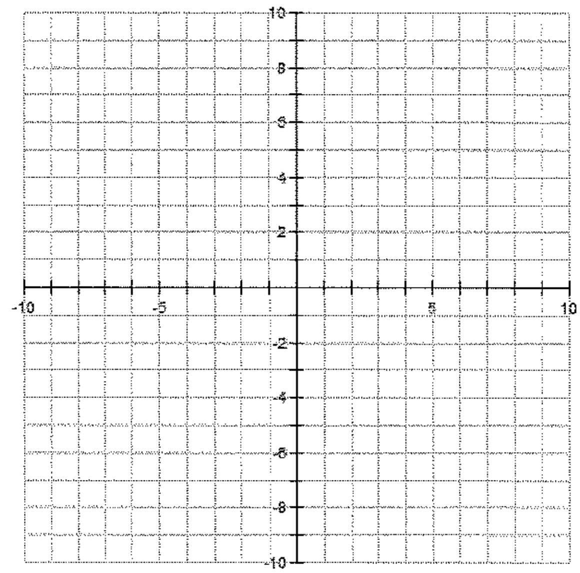
Let's put it all together….

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



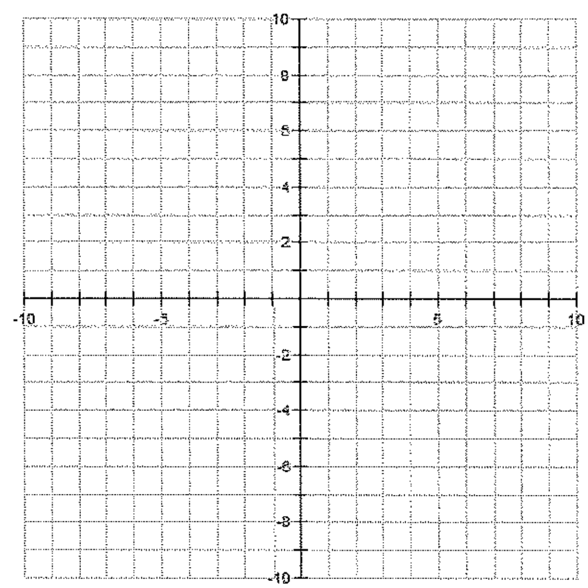
Hole(s)	Vertical Asymptote(s)	Horizontal Asymptote	*x*-intercept(s)	*y*-intercept	*Domain*	*Range*

2.) $f(x) = \frac{x^3+3x^2-10x}{x^2+5x} = \frac{x(x+5)(x-2)}{x(x+5)}$



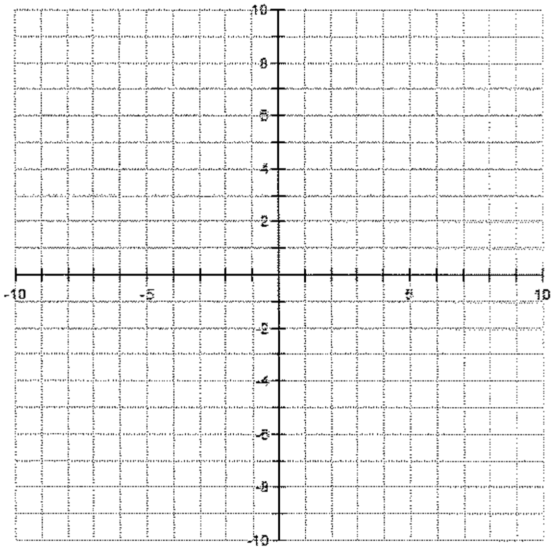
Hole(s)	Vertical Asymptote(s)	Horizontal Asymptote	*x*-intercept(s)	*y*-intercept	***Domain***	***Range***

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



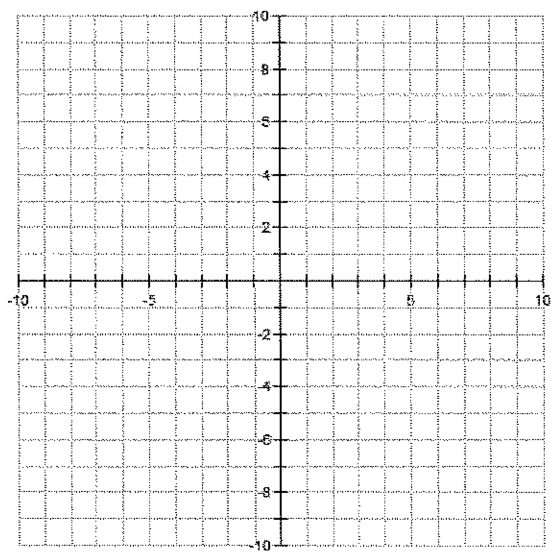
Hole(s)	Vertical Asymptote(s)	Horizontal Asymptote	*x*-intercept(s)	*y*-intercept	***Domain***	***Range***

4.) $f(x) = \frac{x^3+4x^2-21x}{x^2+4x-21}$



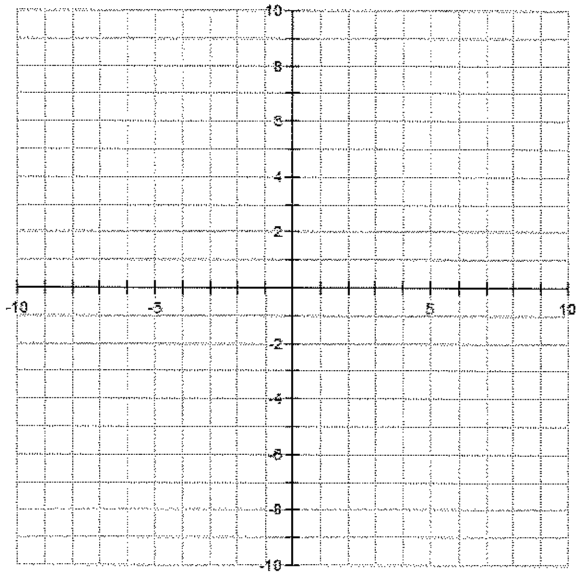
Hole(s)	Vertical Asymptote(s)	Horizontal Asymptote	*x*-intercept(s)	*y*-intercept	***Domain***	***Range***

5.) $f(x) = \frac{(x-5)(x-9)(x+1)}{(x-9)(x+1)}$



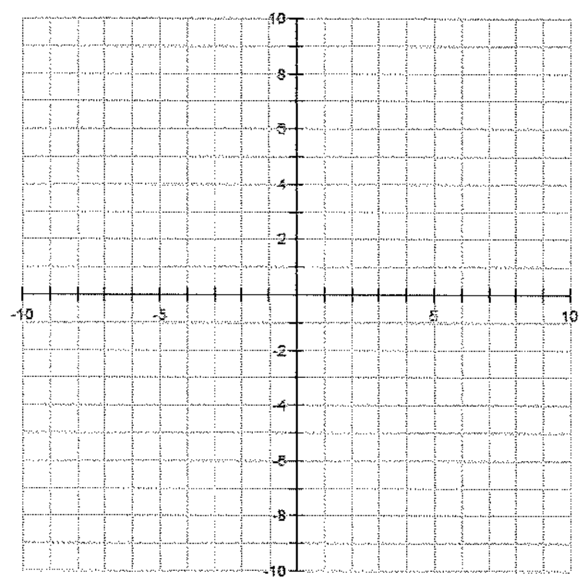
Hole(s)	Vertical Asymptote(s)	Horizontal Asymptote	*x*-intercept(s)	*y*-intercept	***Domain***	***Range***

6.) $f(x) = \frac{x^2+x-2}{(x+2)(x^2-2x-15)}$



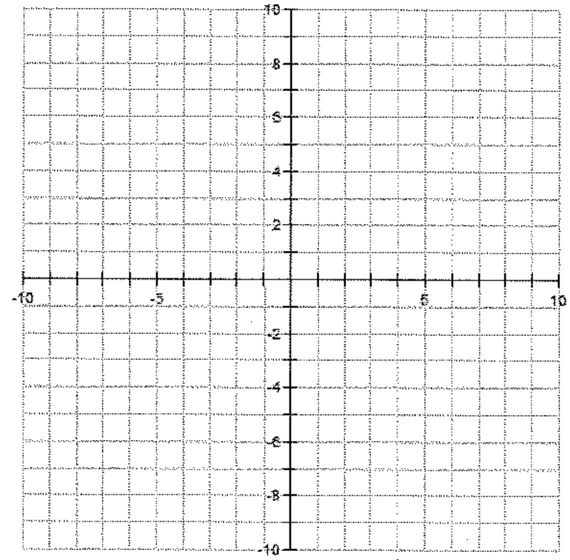
Hole(s)	Vertical Asymptote(s)	Horizontal Asymptote	*x*-intercept(s)	*y*-intercept	***Domain***	***Range***

7.) $f(x) = \frac{x^2+x-6}{(x-2)(x^2+5x-36)} = \frac{(x+3)(x-2)}{(x-2)(x+9)(x-4)}$



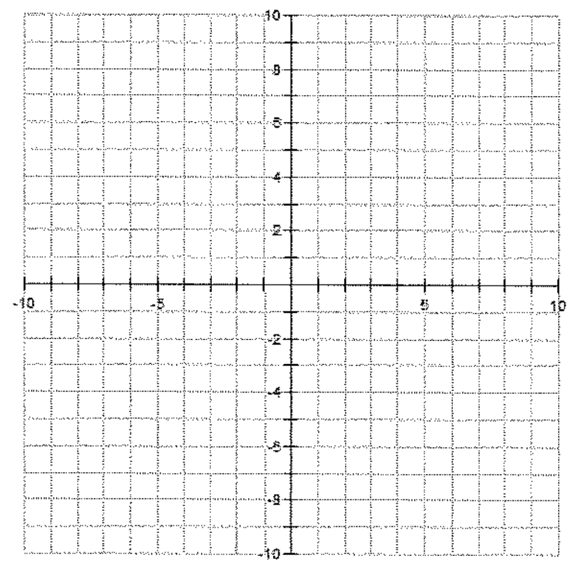
Hole(s)	Vertical Asymptote(s)	Horizontal Asymptote	*x*-intercept(s)	*y*-intercept	***Domain***	***Range***

8.) $f(x) = \frac{3x^2}{x^2-1}$



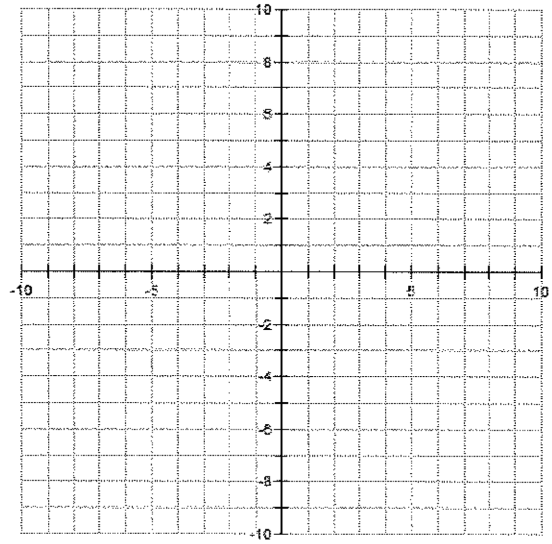
Hole(s)	Vertical Asymptote(s)	Horizontal Asymptote	x-intercept(s)	y-intercept	***Domain***	***Range***

9.) $f(x) = \frac{x^2+7x+12}{x^2+11x+28}$



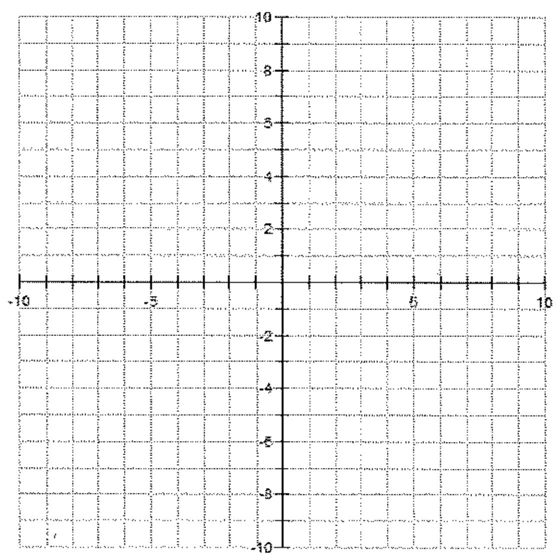
Hole(s)	Vertical Asymptote(s)	Horizontal Asymptote	x-intercept(s)	y-intercept	***Domain***	***Range***

10.) $f(x) = \frac{x^2-6x-7}{x^2+3x-4} = \frac{(x-7)(x+1)}{(x+4)(x-1)}$



Hole(s)	Vertical Asymptote(s)	Horizontal Asymptote	x-intercept(s)	y-intercept	***Domain***	***Range***

11.) $f(x) = \frac{x+8}{x^2+5x-24}$



Hole(s)	Vertical Asymptote(s)	Horizontal Asymptote	x-intercept(s)	y-intercept	***Domain***	***Range***

Lesson 4-3: Graphing Absolute, Step, and Partial Functions

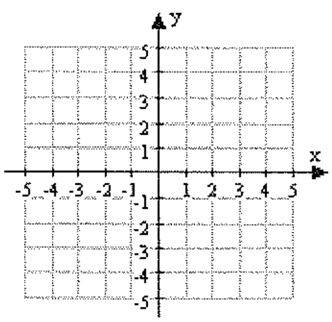
Learning Target: R10: ______________________________

R11: ______________________________

R12: ______________________________

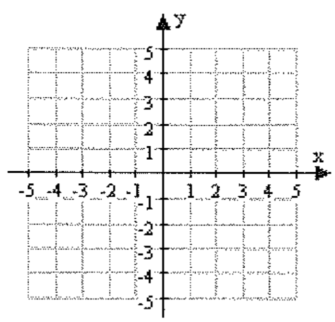
1. $f(x)=|x|$

x	y
−4	
−2	
−1	
0	
1	
2	
4	



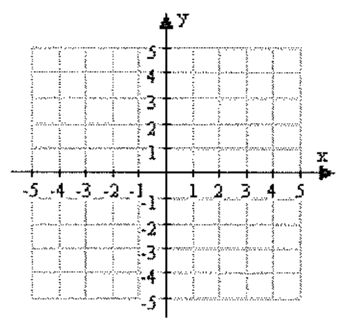
2. $f(x)=2|x|$

x	y
−3	
−2	
−1	
0	
1	
2	
3	



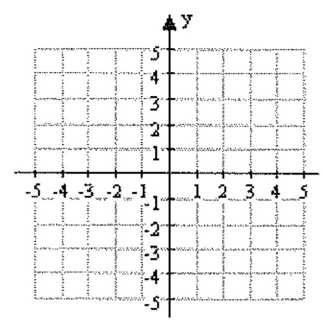
3. $f(x)=0.5|x|$

x	y
−4	
−2	
0	
1	
2	
3	
4	



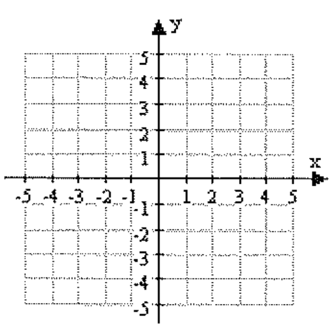
4. $f(x)=-2|x|$

x	y
−4	
−1	
0	
1	
2	
3	
4	



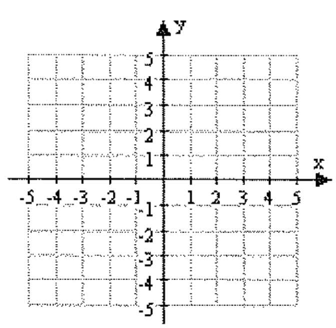
6. $f(x)=|x|-3$

x	y
−4	
−2	
−1	
0	
1	
2	
4	



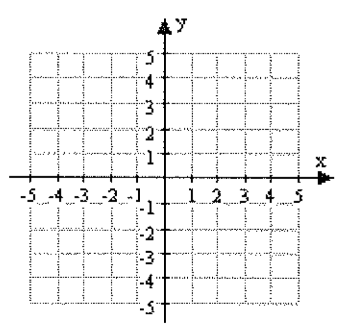
7. $f(x)=|x+2|$

x	y
−5	
−4	
−3	
−2	
−1	
0	
1	



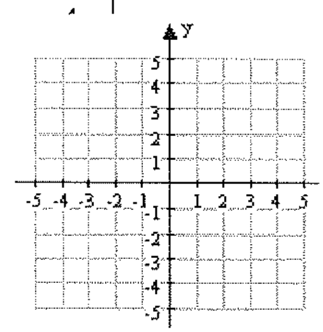
8. $f(x)=2|x-1|$

x	y
−2	
−1	
0	
1	
2	
3	
4	



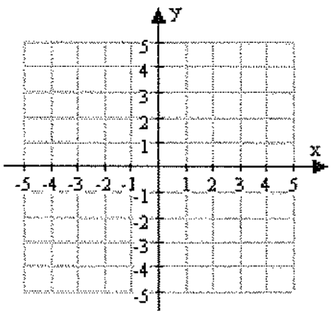
9. $f(x)=-|x-2|+3$

x	y
−2	
−1	
0	
1	
2	
3	



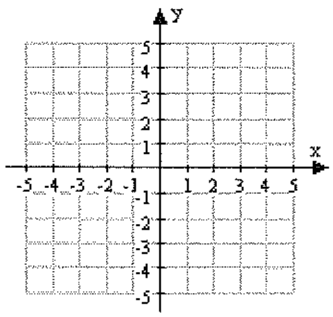
11. $f(x) = \lceil x \rceil$

x	y
– 0.5	
0	
0.5	
1	
1.2	
2	
2.4	



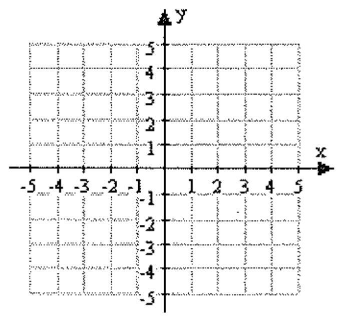
12. $f(x) = \lfloor x \rfloor$ or $f(x) = [\![x]\!]$

x	y
– 0.5	
0	
0.5	
1	
1.2	
2	
2.4	



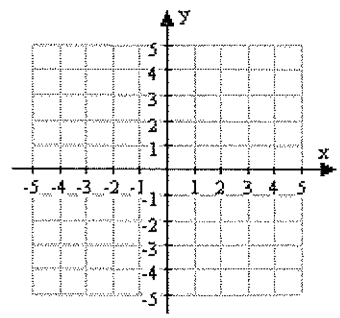
13. $f(x) = \lceil 0.5x \rceil + 1$

x	y
– 0.5	
0	
0.5	
1	
1.2	
2	
2.4	



14. $f(x) = 2[\![x-1]\!]$

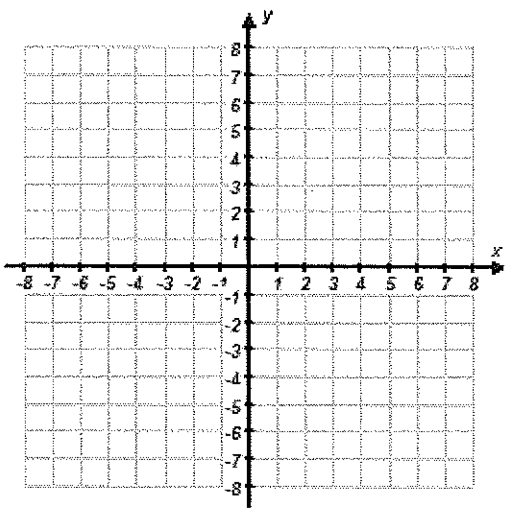
x	y
– 0.5	
0	
0.5	
1	
1.2	
2	
2.4	



15. Graph the following partial functions (piece-wise).

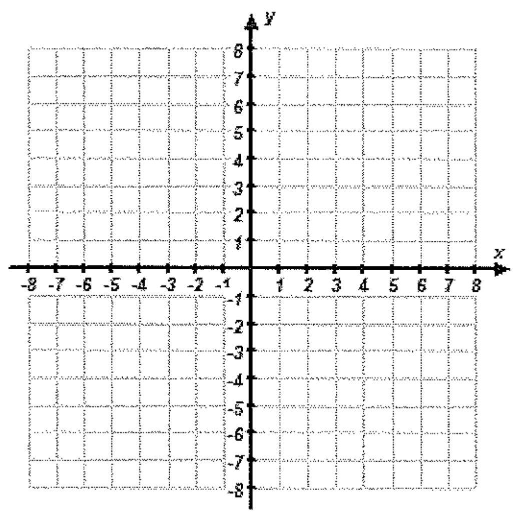
a.

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



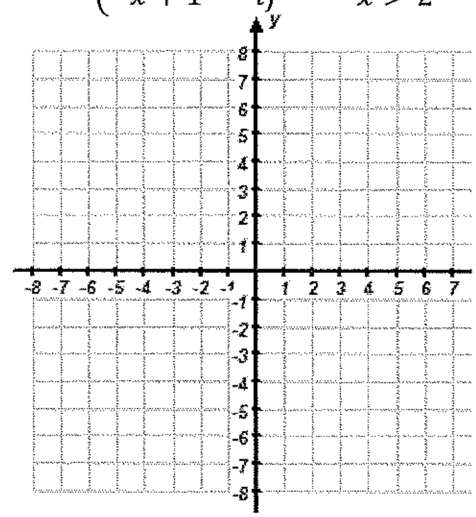
b.

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



c.

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



Name: ____________________ Date: ____________

Find the vertical & horizontal asymptotes, x & y ints, and holes:

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

hole: ________

V.A: ________

H.A: ________

x-Int.: ________

y-int: ________

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

hole: ________

V.A: ________

H.A: ________

x-Int.: ________

y-int: ________

3. $f(x) = \dfrac{x^2 - 5x + 6}{x^2 - 4x + 3}$

hole: ________

V.A: ________

H.A: ________

x-Int.: ________

y-int: ________

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

hole: ________

V.A: ________

H.A: ________

x-Int.: ________

y-int: ________

5. $f(x) = \dfrac{2x^2 - 4x}{x^2 - 2x - 3}$

hole: ________

V.A: ________

H.A: ________

x-Int.: ________

y-int: ________

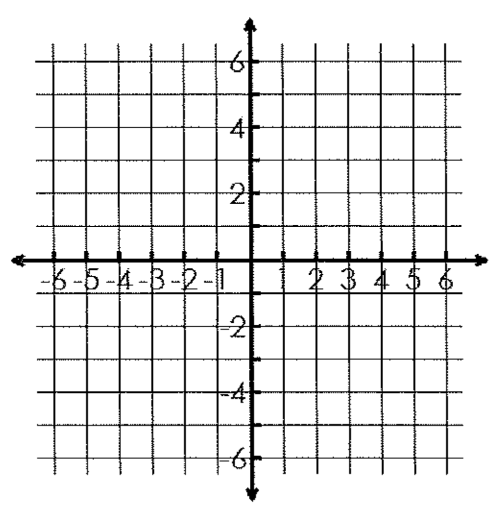
6. $f(x) = \dfrac{x+4}{x^2 + 3x - 4}$

Hole: ________

V.A: ________ H.A: ________

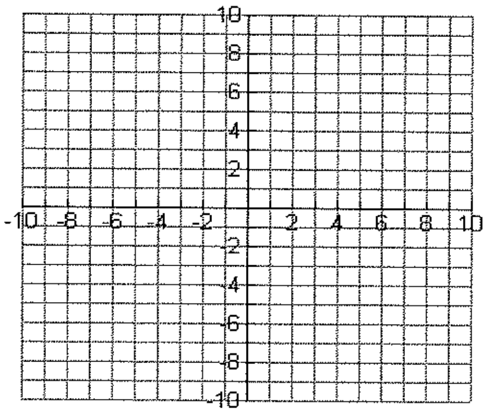
x-Int.: ________ y-int: ________

D: ________ R: ________



23a

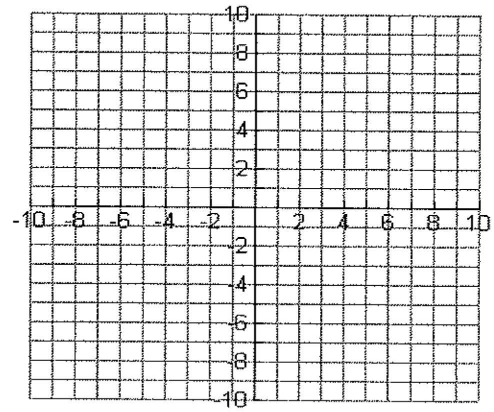
1. Graph $f(x) = \dfrac{5}{x+3}$



x – int ________ HA____________

y – int ________ VA____________

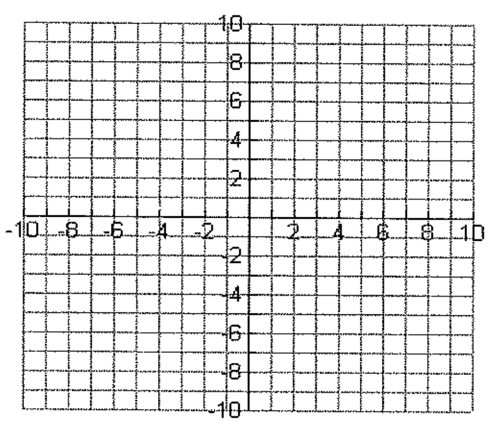
2. Graph $f(x) = \dfrac{2x-1}{x+3}$



x – int ________ HA____________

y – int ________ VA____________

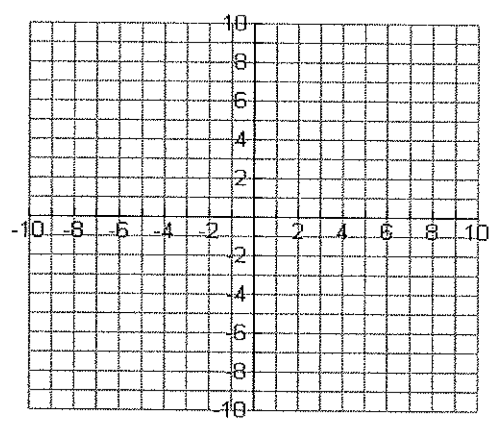
3. Graph $f(x) = \dfrac{2x^2+3x-2}{x^2-9}$



x – int ________ HA____________

y – int ________ VA____________

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



x – int ________ HA____________

y – int ________ VA____________

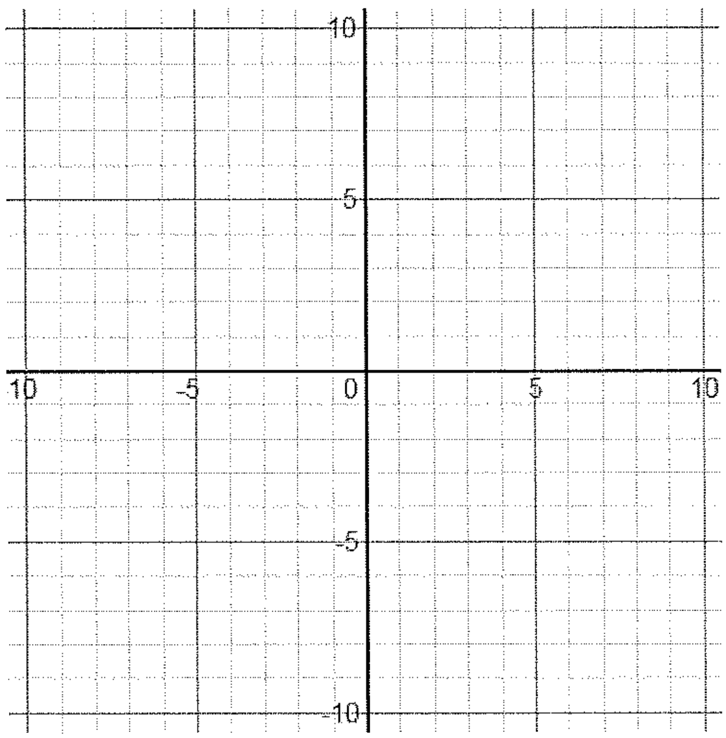
23b

Unit 4 – QUIZ REVIEW – Graphing Rationals **Name: ____________________________**

R8: I can graph rational functions.
R9: I can identify characteristics of a rational function.

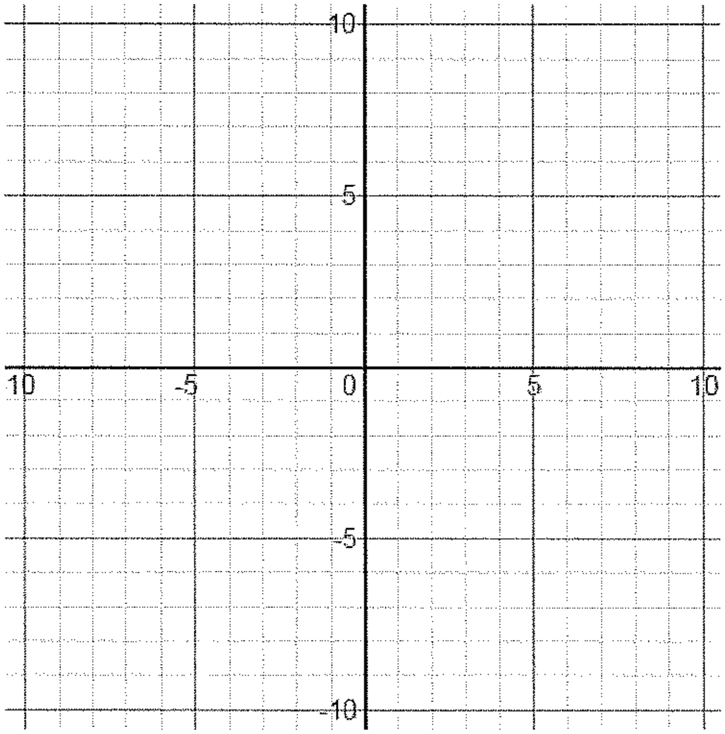
Graph the following and identify the characteristics:

1) The graph of $h(x)=\dfrac{x^2-3x-4}{x^3-4x^2-9x+36}=\dfrac{(x-4)(x+1)}{(x-4)(x+3)(x-3)}$ = ☐



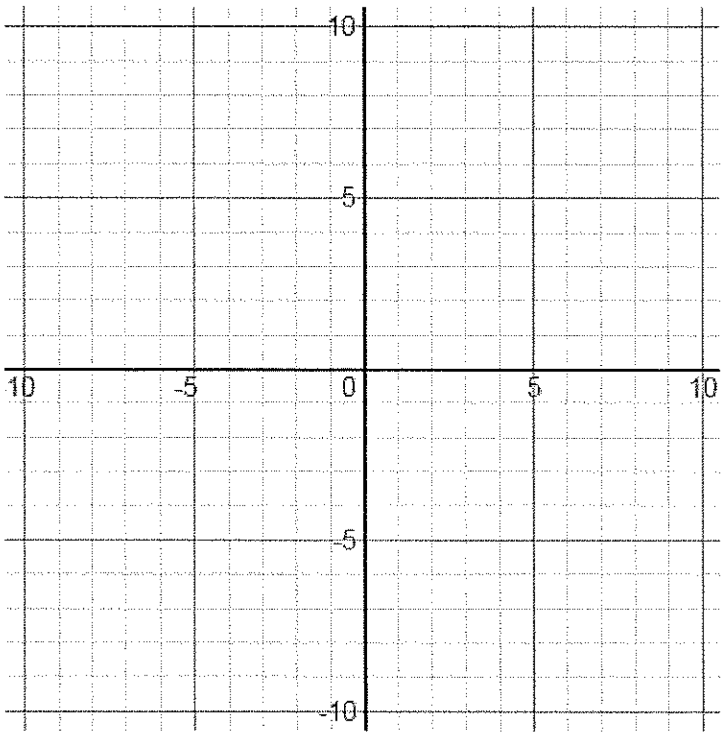
Hole(s)	Vertical Asymptote(s)	Horizontal Asymptote	X-intercept(s)	*Y*-intercept	Domain	Range

2) Let $r(x)=\frac{x^2-2x-8}{x^2-x-12}=\frac{(x-4)(x+2)}{(x-4)(x+3)}$ =



Hole(s)	Vertical Asymptote(s)	Horizontal Asymptote	X-intercept(s)	Y-intercept	Domain	Range

3) Let $r(x)=\dfrac{x^2-x-12}{x-4}=\dfrac{(x-4)(x+3)}{(x-4)}$ $=$ ☐



Hole(s)	Vertical Asymptote(s)	Horizontal Asymptote	X-intercept(s)	*Y*-intercept	Domain	Range

DON'T FORGET RADICAL FUNCTIONS...

R1: I can graph square root functions.
R2: I can graph cube root functions.
R3: I can solve radical functions.

Graph the following and identify the domain and range for each:

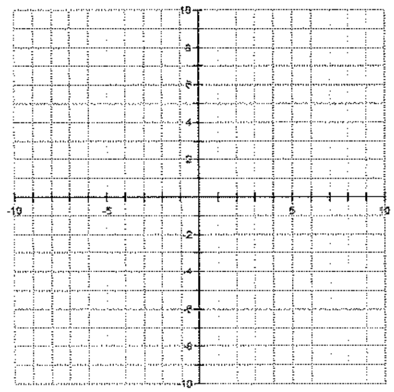
1. $f(x) = \sqrt{x-3} - 2$

x	y
1	
2	
3	
4	
7	
10	

Pivot Point: ____________

Domain: ____________

Range: ____________



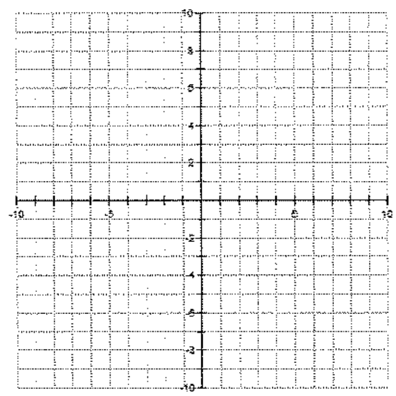
2. $f(x) = \sqrt[3]{x+2} - 4$

x	y
-10	
-6	
-3	
-2	
-1	
3	
6	
10	

Pivot Point: ____________

Domain: ____________

Range: ____________



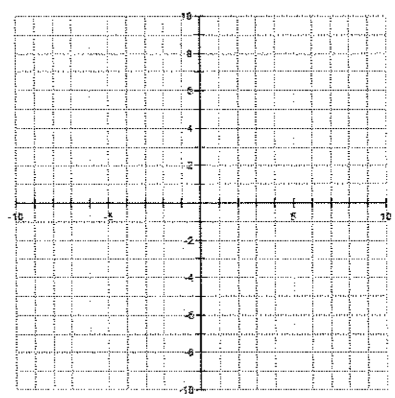
3. f(x) = $f(x) = 3\sqrt[3]{x-2}$

x	y
-10	
-6	
-2	
1	
2	
3	
6	
10	

Pivot Point: ____________

Domain: ____________

Range: ____________



Identify the domain and range algebraically:

4. $f(x) = \sqrt{x-18} + 4$

Domain: ________________

Range: ________________

5. $f(x) = \sqrt[3]{x-8} + 7$

Domain: ________________

Range: ________________

6. $f(x) = \sqrt{x+1} - 7$

Domain: ________________

Range: ________________

Solve each of the following equations. Show organized work to support your answers. Be sure to check for extraneous solutions.

7. $\sqrt{v+7} - 3 = 3$

8. $\sqrt{4x} = \sqrt{6x-2}$

9. $\sqrt{p+10} = 2$

10. $\sqrt[3]{4x+1} = \sqrt[3]{17}$

11. $3\sqrt{x+4} + 13 = 1$

12. $5\sqrt{3x+3} - 9 = 16$

Lesson 4-4: Simplifying, Multiplying, and Dividing Rational Expressions

Learning Target: R5: ____

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Basic Simplifying:

1. $\frac{x^2+x-20}{x^2-25}$

2. $\frac{x^2-36}{x^2-3x-18}$

3. $\frac{x^2+2x-15}{x^2-9}$

4. $\frac{4x+36}{x^2+13x+36}$

You Try:

5. $\frac{x^2-15x+54}{x^2-81}$

6. $\frac{x^2-2x-24}{x^2+10x+24}$

Multiplying and Dividing:

1. $\frac{x+2}{x^2-4x-12} \cdot \frac{x^2-36}{x-2}$

2. $\frac{x^2+x-2}{x^2+5x-6} \cdot \frac{x+6}{x+5}$

3. $\frac{1}{3m+6} \cdot \frac{3}{m+3}$

4. $\frac{2a+4}{8a^2} \cdot \frac{12a}{a+2}$

5. $\frac{y^2-2y-15}{y^2-3y-10} \cdot \frac{y^2-4y+3}{y^2-9}$

6. $\frac{2x^2-3x-2}{3x-6} \cdot \frac{6x}{4x^2-1}$

7. $\frac{x^2+3x-10}{x^2-2x-15} \div \frac{x^2+x-6}{x^2+6x+9}$

8. $\frac{x+5}{2x} \div \frac{x+5}{8}$

9. $\frac{m^2}{m+5} \div \frac{m^2+5m}{m^2+10m+25}$

10. $\frac{p^2+2p-3}{p^2+2p-8} \div \frac{p^2-1}{p-2}$

11. $\dfrac{\dfrac{x^2-4x}{x^2-8x+16}}{\dfrac{12}{2x-8}}$

12. $\dfrac{\dfrac{b+3}{b^2+6b+9}}{\dfrac{b+2}{b^2-9}}$

You Try:

13. $\dfrac{x-1}{x+5} \cdot \dfrac{x^2+x-20}{x^2-8x+7}$

14. $\dfrac{x+9}{7x^3} \cdot \dfrac{14x}{4x+36}$

15. $\dfrac{x^2+1x-30}{x-7} \div \dfrac{x^2+12x+36}{7-x}$

16. $\dfrac{x-2}{(4x+3)^2} \div \dfrac{(x-2)^2}{4x+3}$

Lesson 4-5: Adding and Subtracting Rational Expressions

Learning Target: R6: ______________________________

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1. $\frac{5y}{4y^2} + \frac{12}{4y^2} + \frac{3y}{4y^2}$

2. $\frac{9a^3}{3a^2} - \frac{6a}{3a^2}$

3. $\frac{2t}{3t-12} - \frac{8}{3t-12}$

4. $\frac{w^2}{w^2-9} + \frac{2w-15}{w^2-9}$

5. $\frac{a^2+10}{a^2-4} - \frac{7a}{a^2-4}$

6. $\frac{y^2-13}{y^2-25} + \frac{3(1-y)}{y^2-25}$

7. $\frac{2}{y^2} + \frac{1}{3} - \frac{5}{6y^2}$

8. $\frac{x^2-12}{x^2-4} + \frac{2}{x-2}$

9. $\frac{d}{d^2-1} - \frac{d}{d-1}$

10. $\frac{x}{x+1} + \frac{8}{x-2}$

11. $\frac{3}{m+2} + \frac{m^2}{m^2-4} - \frac{1}{m-2}$

12. $\frac{6}{a^2-2a-35} - \frac{2}{a^2+9a+20}$

You Try:

13. $\frac{3}{x-1} + \frac{5}{x+1}$

14. $\frac{x}{x^2-2x-3} + \frac{x}{x^2+5x+4}$

15. $\frac{2x+1}{x-4} - \frac{x+5}{x-4}$

16. $\frac{6}{5x+15} - \frac{1}{x+3}$

Lesson 4-6: Solving Rational Expressions

Learning Target: R7: ____

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1. $\frac{4}{x^2} = \frac{1}{9}$

2. $\frac{2t}{t-2} = \frac{t+4}{t-2}$

3. $\frac{b+2}{b-3} = \frac{3b-4}{b-3}$

4. $\frac{w^2}{w-4} - \frac{8}{w-4} = \frac{2w}{w-4}$

5. $\frac{5}{x-4} = \frac{3}{x}$

6. $\frac{p^2}{p+2} = \frac{4p+12}{p+2}$

7. $\frac{4a^2-9}{2a-3} = 9$

8. $\frac{x^2-3x+4}{x-4} = -4$

9. $\frac{2}{3x^2} = \frac{1}{x} - \frac{1}{3}$

10. $\frac{x}{x-4} = \frac{x+10}{x-2}$

11. $\frac{p-1}{p+3} - \frac{2}{p-3} = \frac{7-3p}{p^2-9}$

12. $\frac{x}{x-2} + \frac{2}{x+3} = \frac{3x+4}{x^2+x-6}$

You Try:

13. $\frac{1}{6x^2} + \frac{1}{6x} = \frac{1}{x^2}$

14. $\frac{x-2}{x-5} = \frac{3}{x-5}$

15. $x + \frac{7}{x} = -8$

16. $\frac{6x}{3-x} = \frac{2x^2}{x-3}$

UNIT 4 TEST REVIEW Name: ______________________

Graphing Rational and Radical Functions and their characteristics:

1. $y = \frac{x+5}{x^2+2x-15} = \frac{1(x+5)}{(x-3)(x+5)}$

   A. Holes:

   B. Vertical Asymptote(s):

   C. Horizontal Asymptote(s):

   D. y-intercept:

2. $y = \frac{x^2+3x-18}{x^2+2x-15} = \frac{(x-3)(x+6)}{(x-3)(x+5)}$

   A. Holes:

   B. Vertical Asymptote(s):

   C. Horizontal Asymptote(s):

   D. y-intercept:

   E. x-intercept(s):

Use the Graphs to the right to graph the functions if you need to:

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

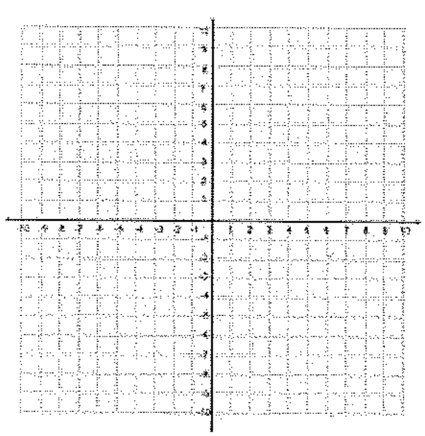
   A. Domain:

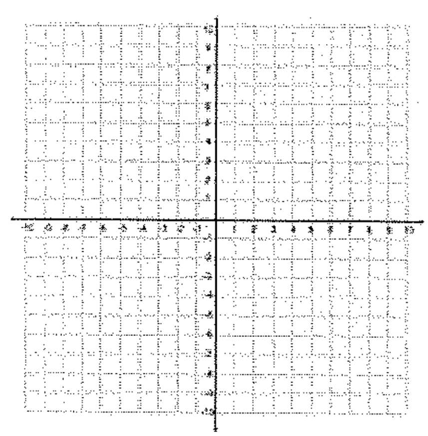
   B. Range:

4. f(x) = $\sqrt[3]{x+7} - 5$

   A. Domain:

   B. Range:

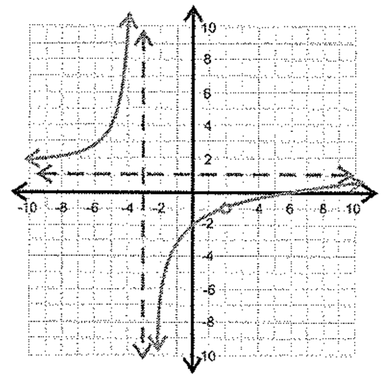




5. Use the graph to the right to identify the following:

A. Domain:

B. Range:



6. Simplify the following:

A. $\frac{x^2-13x+30}{x^2-x-6}$

B. $\frac{x^2-9}{x+3}\cdot\frac{x^2+4x+3}{2x-6}$

C. $\frac{x+2}{x+5}\div\frac{x^2+6x+8}{x+5}$

D. $\frac{x}{x-4}-\frac{x+5}{x-4}$

E. $\frac{x}{x^2-3x-10}+\frac{3}{x-5}$

7. Solve the following:

A. $7\sqrt{3x+4}-5=30$

B. $\sqrt[3]{3x+5}+10=12$

C. $\sqrt{8x+2}=\sqrt{2x+20}$

D. $x+\frac{12}{x}=-7$

E. $\frac{2}{x+3}=\frac{1}{x-4}$

UNIT 4 – Graphing Radical and Rational Functions

UNIT 4 Reflection **Name:** ____________________________

What about this unit did you find to be the easiest? ____

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What about this unit did you find to be the most difficult? ______________________________________

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Are you on track to pass this course? If not, what is your game plan? What are you going to do to help yourself master this course?

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What are your plans after high school? Do you plan to go to college? Go into the work force, etc? Do you feel prepared? Have you taken the SAT/ACT or are you scheduled to take it?

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Where do you see yourself in the next 10 years? What are your goals?

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