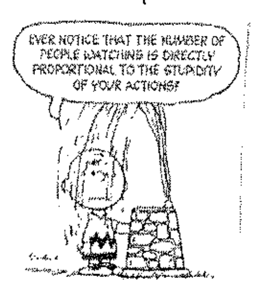
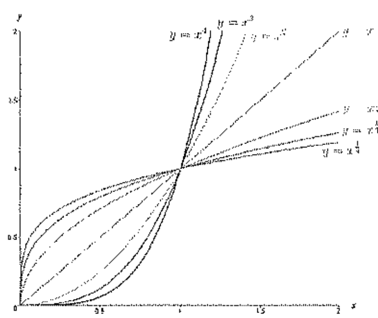
Common Core Math II Name Key

UNIT 4A:	Advanced Functions and Modeling	HOMEWORK
11/4/13 Monday	Absolute Value and Transformations Pages 1-8	
11/5/13 Tuesday	Inverse Variation Pages 9-16	
11/6/13 Wednesday	Inverse Variation Pages 17-24	
11/7/13 Thursday	Radicals Pages 25-30 **QUIZ**	
11/8/13 Friday	Radicals Pages 31-36 EARLY RELEASE	
11/11/13 Monday	Power Functions Pages 37-42	
11/12/13 Tuesday	Power Functions Pages 37-42	
11/13/13 Wednesday	Rational Equations Pages 47-50	
11/14/13 Thursday	Piecewise Functions Pages 51-58 **QUIZ**	
11/15/13 Friday	Greatest Integer Functions Pages 59-64	
11/18/13 Monday	Review	
11/19/13 Tuesday	TEST	

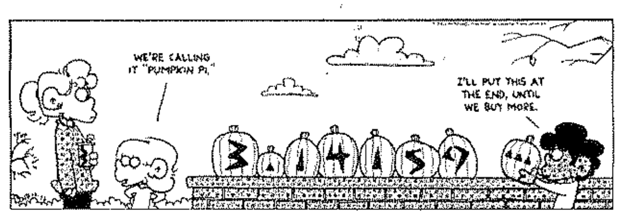
WED 11/20



Direct Variation



Power Functions



Hope you had a happy Halloween!

U2 L6 LAB: Absolute Value Transformations

Name ______________________ Date __________ Period _____

2) The **vertex** of the absolute value graph is the turning point of the graph. max min highest, lowest, extrema,

What is the vertex of $y = |x|$ **?** (0,0)

What is the vertex of $y = |x+3|$ **?** (-3,0)

How do these two points help you to verify the direction of the transformation? vertex (0-3, 0)

It shows that it goes 3 units to left because of -3.

3) Graph $y = |x| + 3$ **in Y2. How have you transformed the graph of** $y = |x| + 3$ **?**

(h,k): vertex

The graph went 3 **units** Up

Name the coordinates of the vertex of $y = |x|$ **and** $y = |x| + 3$

(0,0) (0,3)

$y = |x| + k$ up k units

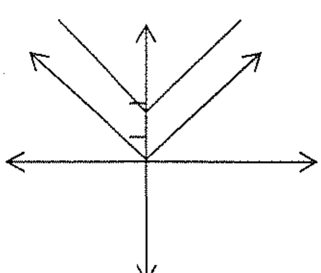
How do these points help verify the transformation?

$y = |x| - k$ down k units

The vertex moved up 3 units (0, 0+3)

Next, you will transform the graph of $y = |x|$ **by making changes to** ***y*****.**

Write a function for Y2 to create each of the graphs below:



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

Absolute Value Functions

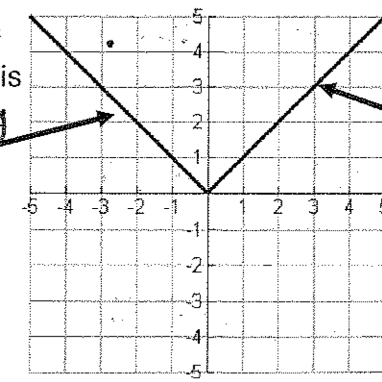
Vocabulary

- The function f(x) = |x| is an absolute value (piecewise)

$$|x| = \begin{cases} -x, & if\ x < 0 \\ 0, & if\ x = 0 \\ x, & if\ x > 0 \end{cases}$$

The graph of this piecewise function consists of 2 rays, is V-shaped, and opens up.

To the left of x=0 the line is decreasing y=-x

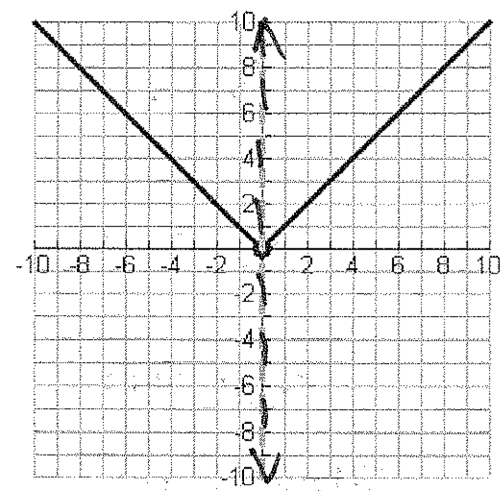


To the right of x = 0 the line is increasing y=x

Notice that the graph is symmetric over the y-axis because for every point (x,y) on the graph, the point (-x,y) is also on it.

Vocabulary

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



- **Absolute Value Function** $y = |x|$
- **Vertex** (0,0)
- **Axis of Symmetry** $x = 0$

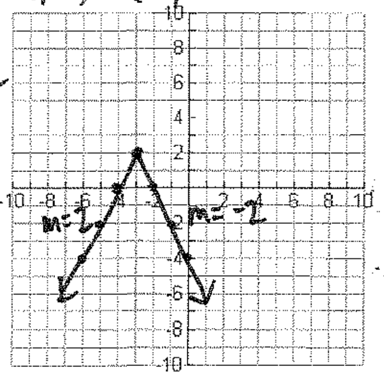
4

9

Example 2:

- Graph y = -2 |x + 3| + 2.
  - What is your vertex? (-3,2)
  - What are the intercepts? (-4,0) (-2,0)
  - What are the zeros?

x= -4 x=-2



You Try:

- Graph y = -1/2 |x – 1| - 2
  - Compare the graph with the graph of y = |x|

(what are the transformations)

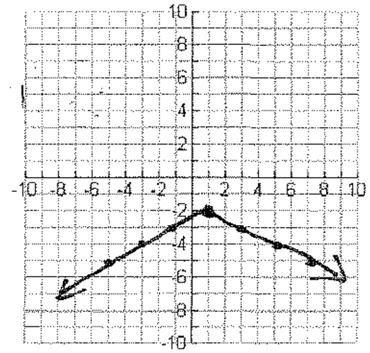
(1,-2)

right 1

down 2

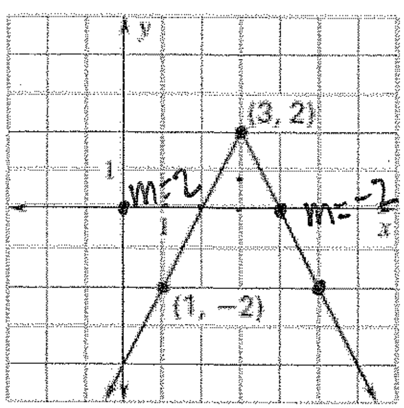
widens by 1/2

reflects x axis



Example 3:

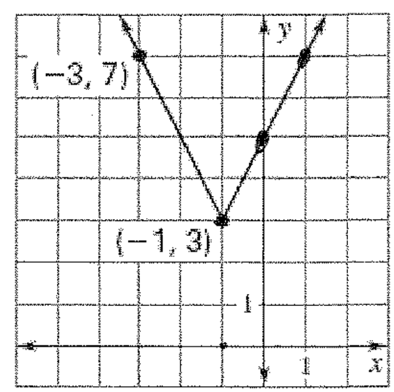
- Write a function for the graph shown.



y= -2 |x-3| +2

You Try:

- Write a function for the graph shown.



left 1

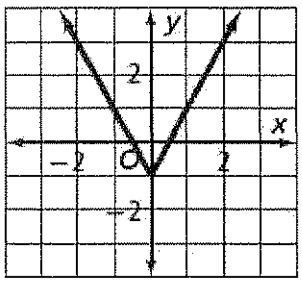
up 3

y = 2 |x+1| +3

Unit 2 Lesson 6 - Absolute Value Transformations – HOMEWORK

Match each equation with its graph.

1. $y = |x - 1|$ E
2. $y = 2|x - 1|$ C
3. $y = |2x| - 1$ A
4. $y = |x| - 1$ F
5. $y = |2x - 1|$ B
6. $y = |2x| - 2$ D

A.


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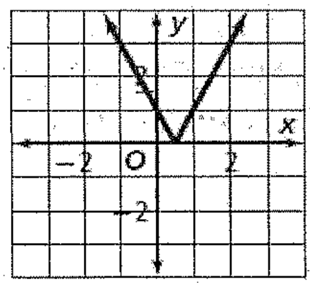

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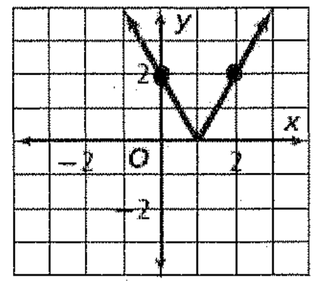

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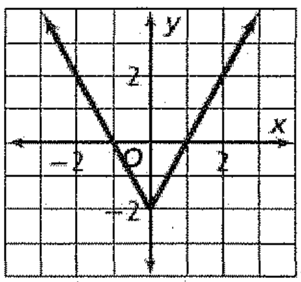
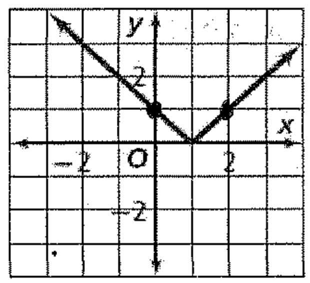


E.


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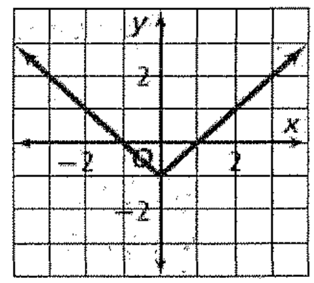


Describe each transformation of f(x) = |x| using Up, down, left, right, and the number of units.

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

left 2

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

left 4

3. $f(x) = |x| - 5$

down 5

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

left 1, down 1

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

right 2, up 1

6. $f(x) = \left|x - \frac{3}{2}\right|$

right $\frac{3}{2}$

7. $f(x) = |x| - \frac{1}{3}$

down $\frac{1}{3}$

8. $f(x) = \left|x - \frac{5}{2}\right|$

right $5/2$

9. $f(x) = \left|x + \frac{1}{2}\right| + \frac{3}{2}$

left $\frac{1}{2}$, up $\frac{3}{2}$

Go to page 2

8

Let's Try Some Examples!

5. Suppose y varies inversely as x. If $x = -13$ and $y = 100$, find y when $x = 5$. (Hint: First find k)

   $y = -260$

6. Suppose y varies inversely as x. If $y = -6$ and $x = -2$, find y when $x = 5$

   $y = 2.4$

7. Suppose y varies inversely as x. If $y = 725$ when $x = 20$, find x when $y = 50$.

   $x = 290$

Application Problems (First decide...Direct or Inverse Variation???)

8. The frequency of a vibrating string is inversely proportional to its length. A violin string 12 in. long vibrates at a frequency of 510 cycles per second. Find the frequency of an 8-in string. 765 cycles per Second

9. The time (t) required to empty a tank varies inversely as the rate(r) of the pumping. A pump can empty a tank in 45 minutes at the rate of 600 kiloliters per minute. How long will it take the pump to empty the tank at the rate of 1000 kL/m? 27 min

10. The number (N) of plastic straws produced by a machine varies directly as the amount of time (t) the machine is operating. The machine produces 20,000 straws in 8 hours. How many straws will be produced in 50 hours? 125,000 straws

11. If it takes 4 people 6 hours to completely clean the gym. How long will it take 5 people? 4.8 hours

12. Using 3 tractors, it takes 4 hours to plow a field. How long will it take using 5 tractors? 2.4 hours

HW: U2 L2 Homework

10/28/2013

10-1 Inverse Variation

Additional Example 1C: Identifying an Inverse Variation

Tell whether the relationship is an inverse variation. Explain.

$\mathbf{2xy = 28}$

$\frac{2xy}{2} = \frac{28}{2}$ *Find xy. Since xy is multiplied by 2, divide both sides by 2 to undo the multiplication.*

$xy = 14$ *Simplify.*

xy equals the constant 14, so the relationship is an inverse variation. The equation can be written in the form $y = \frac{k}{x}$.

< Back Next > Preview Main

10-1 Inverse Variation

Check It Out! Example 1a

Tell whether each relationship is an inverse variation. Explain.

x	y
–12	24
1	–2
8	–16

Method 1 Write a function rule.

$y = -2x$ *Cannot write in* $y = \frac{k}{x}$ *form.*

The relationship is not an inverse variation.

Method 2 Find xy for each ordered pair.

$-12(24) = -228,\ 1(-2) = -2,\ 8(-16) = -128$

The product xy is not constant, so the relationship is not an inverse variation.

< Back Next > Preview Main

10-1 Inverse Variation

Check It Out! Example 1b

Tell whether each relationship is an inverse variation. Explain.

x	y
3	3
9	1
18	0.5

Method 1 Write a function rule.

$y = \frac{9}{x}$ *Can write in* $y = \frac{k}{x}$ *form.*

The relationship is an inverse variation.

Method 2 Find xy for each ordered pair.

$3(3) = 9,\ 9(1) = 9,\ 18(0.5) = 9$

The product xy is constant, so the relationship is an inverse variation.

< Back Next > Preview Main

10-1 Inverse Variation

Check It Out! Example 1c

Tell whether each relationship is an inverse variation. Explain.

$\mathbf{2x + y = 10}$ *Cannot write in* $y = \frac{k}{x}$ *form.*

The relationship is not an inverse variation.

< Back Next > Preview Main

10-1 Inverse Variation

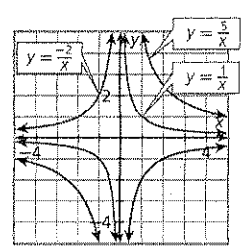
Helpful Hint

Since k is a nonzero constant, $xy \neq 0$. Therefore, neither x nor y can equal 0, and the graph will not intercept the x- or y-axes.

< Back Next > Preview Main

10-1 Inverse Variation

An inverse variation can also be identified by its graph. Some inverse variation graphs are shown. Notice that each graph has two parts that are not connected.



Also notice that none of the graphs contain (0, 0). In other words, (0, 0) can never be a solution of an inverse variation equation.

< Back Next > Preview Main

10-1 Inverse Variation

Additional Example 3: ***Transportation Application***

The inverse variation $xy = 350$ relates the constant speed x in mi/h to the time y in hours that it takes to travel 350 miles. Determine a reasonable domain and range and then graph this inverse variation.

Step 1 Solve the function for y.

$xy = 350$

$y = \frac{350}{x}$ *Divide both sides by x.*

10-1 Inverse Variation

Additional Example 3 Continued

Step 2 Decide on a reasonable domain and range.

$x > 0$ *Speed is never negative and $x \neq 0$*

$y > 0$ *Because x and xy are both positive, y is also positive.*

Step 3 Use values of the domain to generate reasonable ordered pairs.

x	20	40	60	80
y	17.5	8.75	5.83	4.38

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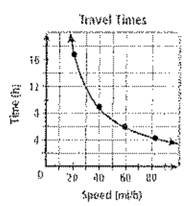
10-1 Inverse Variation

Additional Example 3 Continued

Step 4 Plot the points. Connect them with a smooth curve.



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10-1 Inverse Variation

Remember!

Recall that sometimes domain and range are restricted in real-world situations.

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10-1 Inverse Variation

Check It Out! Example 3

The inverse variation $xy = 100$ represents the relationship between the pressure x in atmospheres (atm) and the volume y in mm^3 of a certain gas. Determine a reasonable domain and range and then graph this inverse variation.

Step 1 Solve the function for y.

$xy = 100$

$y = \frac{100}{x}$ *Divide both sides by x.*

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10-1 Inverse Variation

Check It Out! Example 3 Continued

Step 2 Decide on a reasonable domain and range.

$x > 0$ *Pressure is never negative and $x \neq 0$*

$y > 0$ *Because x and xy are both positive, y is also positive.*

Step 3 Use values of the domain to generate reasonable pairs.

x	10	20	30	40
y	10	5	3.34	2.5

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10-1 Inverse Variation

Additional Example 5 Continued

Boyle's law states that the pressure of a quantity of gas x varies inversely as the volume of the gas y. The volume of gas inside a container is 400 in^3 and the pressure is 25 psi. What is the pressure when the volume is compressed to 125 in^3?

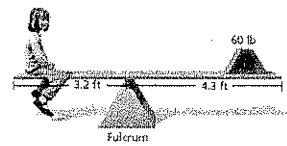
$80 = y_2$

When the gas is compressed to 125 in^3, the pressure increases to 80 psi.

10-1 Inverse Variation

Check It Out! Example 5

On a balanced lever, weight varies inversely as the distance from the fulcrum to the weight. The diagram shows a balanced lever. How much does the child weigh?



10-1 Inverse Variation

Check It Out! Example 5 Continued

$x_1y_1 = x_2y_2$ *Use the Product Rule for Inverse Variation.*

$x_1(3.2) = (60)(4.3)$ *Substitute 3.2 for y_1, 60 for x_2, and 4.3 for y_2.*

$3.2x_1 = 258$ *Simplify.*

$\frac{3.2x_1}{3.2} = \frac{258}{3.2}$ *Solve for x_1 by dividing both sides by 3.2.*

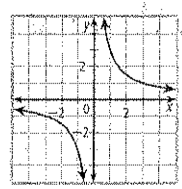
$x_1 = 80.625$ *Simplify.*

The child weighs 80.625 lb.

10-1 Inverse Variation

Lesson Quiz: Part I

1. Write and graph the inverse variation in which $y = 0.25$ when $x = 12$.

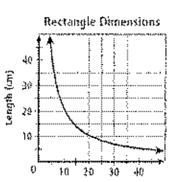


$y = \frac{3}{x}$

10-1 Inverse Variation

Lesson Quiz: Part II

2. The inverse variation $xy = 210$ relates the length y in cm to the width x in cm of a rectangle with an area of 210 cm^2. Determine a reasonable domain and range and then graph this inverse variation.



$x > 0, y > 0$

10-1 Inverse Variation

Lesson Quiz: Part III

3. Let $x_1 = 12$, $y_1 = -4$, and $y_2 = 6$, and let y vary inversely as x. Find x_2.

-8

Course 2 Unit 4
Lesson 2 Investigation 1 Travel Times

3. How do each of the following increases in average speed affect the time for the 250 mile trip?
   - Increase from 20mph to 30mph

     decrease of 4 hours

   - Increase from 35 mph to 45 mph

     decrease of 2 hours

   - Increase from 50 mph to 60 mph

     derease of 1 hour

4. Estimate the average speed necessary to complete the trip in 4.5 hours. How did you find the estimate?

   54 mph

   55 is 4.54

5. Now think about the relation between speed and time for a 300 mile trip.

a. What equation relates driving time *t* and average speed *s* for such a trip?

$t = \frac{300}{s}$

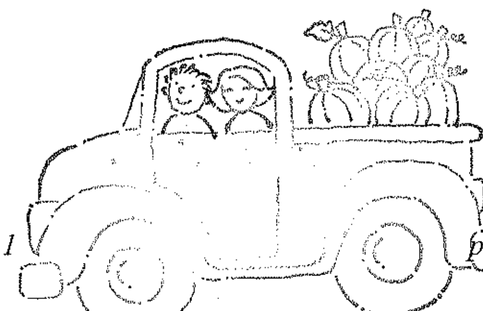
b. Which will produce a greater change in driving time: an increase from 40 to 60 mph or a decrease from 40 to 20 mph? 7.5 5

7.5 15

decrease from 40 to 20 mph

c. Estimate the average speed necessary to complete the trip in 4.5 hours.

$\frac{300}{4.5} = 66.7$ mph



18

Course 2 Unit 4
Lesson 2 Investigation 1 Travel Times

c. Make a table showing the relation between speed and time for speeds of 50 to 500 mph. Make the graph on your calculator.

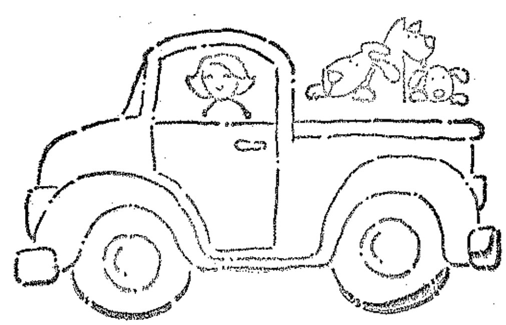
Speed	50	100	150	200	250	300	350	400	450	500
Time	60	30	$\bar{2}0$	15	12	10	8.6	7.5	6.7	6

30 .7

d. Which change in speed causes the greater change in time for the trip: an increase from 50 to 100 mph or an increase from 450 to 500 mph?

Increase from 50 to 100 decreases time by 30 hours.

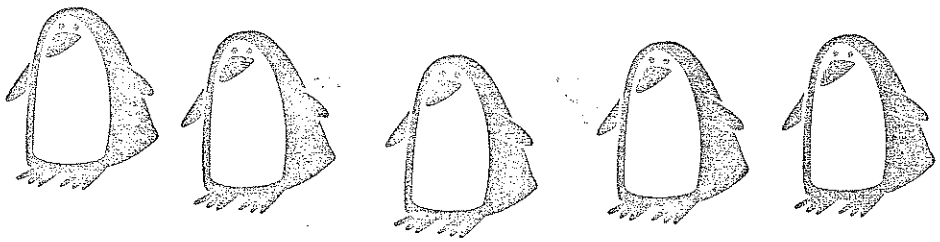
thought you could use a little pickup!



20

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

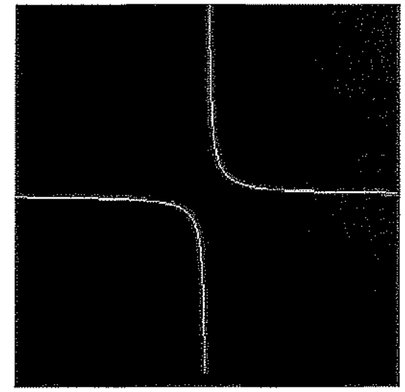
This creates asymptotes at the axis.



The graphs of inverse variations have two parts.

Ex. f(x) = 1/x

Each part is called a branch.



When k is positive, the branches are in Quadrants I and III.

When k is negative, the branches are in Quadrants II and IV.

22

Translations of Inverse Variations:

The graph of $y = \dfrac{k}{x-b} + c$

is a translation of y = k/x, b units horizontally and c units vertically.

The vertical asymptote is $x = b$.

The horizontal asymptote is $y = c$.

Name ____________________ Class ____________ Date ____________

Practice 9-2

Graphing Inverse Variations

Write an equation for a translation of $y = -\frac{3}{x}$ that has the given asymptotes.

1. $x = 2; y = 1$
2. $x = -1; y = 3$
3. $x = 4; y = -2$
4. $x = 0; y = 6$
5. $x = 3; y = 0$
6. $x = 1; y = 2$
7. $x = -3; y = -1$
8. $x = -2; y = 1$

Sketch the asymptotes and the graph of each equation.

9. $y = \frac{3}{x-1} + 2$
10. $y = \frac{2}{x+1}$
11. $y = \frac{11}{x+3} - 3$
12. $y = -\frac{4}{x-2} - 2$
13. $y = \frac{1}{x} + 3$
14. $y = \frac{1}{x+1} - 2$
15. $y = \frac{1}{x-2} + 1$
16. $y = \frac{1}{x-1} - 1$
17. $y = \frac{2}{x}$
18. $y = -\frac{3}{x-3} + 1$
19. $y = \frac{1}{x+1} + 2$
20. $y = \frac{3}{4x} + \frac{1}{2}$
21. $y = \frac{3}{x+3} - 1$
22. $y = \frac{2}{x-5}$
23. $y = -\frac{6}{x-3} - 2$
24. $y = \frac{5}{x}$
25. $y = \frac{1}{x-1} + 1$
26. $y = \frac{1}{x}$
27. $y = -\frac{3}{x-4} - 2$
28. $y = -\frac{1}{x-2} - \frac{1}{2}$

The length of a panpipe p (in feet) is inversely proportional to its pitch ℓ (in hertz). The inverse variation is modeled by the equation $p = \frac{495}{\ell}$.

Find video.

trombone

29. Find the length required to produce a pitch of 220 Hz.
30. What pitch would be produced by a pipe with a length of 1.2 ft?
31. Find the pitch of a 0.6-ft pipe.
32. Find the pitch of a 3-ft pipe.

The junior class is buying keepsakes for the junior-senior prom. The price of each keepsake p is inversely proportional to the number of keepsakes s bought. The equation $p = \frac{1800}{s}$ models this inverse variation.

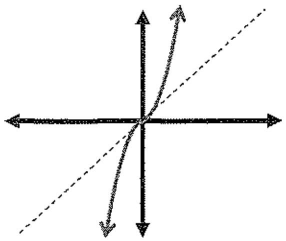
33. If they buy 240 keepsakes, how much can the class spend for each?
34. If they spend \$5.55 for each keepsake, how many can the class buy?
35. If 400 keepsakes are bought, how much can be spent for each?
36. If the class buys 50 keepsakes, how much can be spent for each?

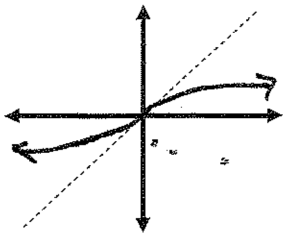
Compare the graphs of the inverse variations.

37. $y = \frac{1}{x}$ and $y = \frac{5}{x}$
38. $y = \frac{3}{x}$ and $y = -\frac{3}{x}$
39. $y = \frac{2}{x}$ and $y = \frac{20}{x}$
40. $y = -\frac{1}{x}$ and $y = -\frac{10}{x}$
41. $y = \frac{6}{x}$ and $y = -\frac{6}{x}$
42. $y = \frac{0.2}{x}$ and $y = \frac{0.02}{x}$

The Cube Root Function

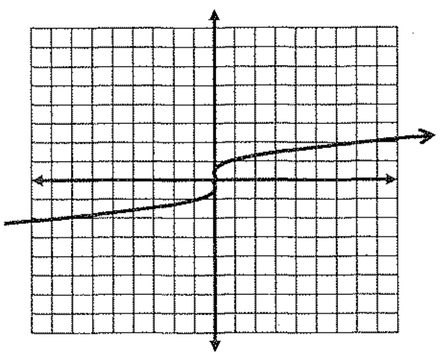
Reflect the function $f(x) = x^3$ over the line $y = x$.





Problems? NONE

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



Characteristics of the graph

Vertex (0,0)

End Behavior As x increases y increases $y \to \infty$
As x decreases, y decreases $y \to -\infty$

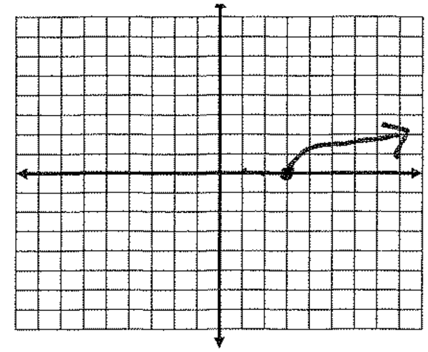
Domain All Reals : $\mathbb{R}$: $\{x \in \mathbb{R}\}$

Range All Reals : $\{y \in \mathbb{R}\}$

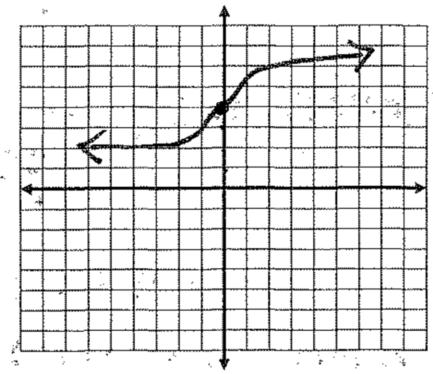
Symmetry rotational

Pattern

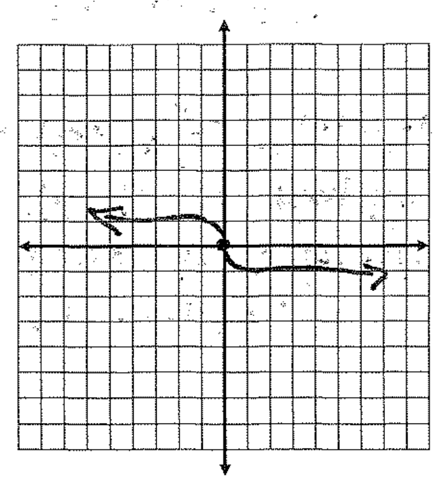
1) $f(x) = \sqrt{x-3}$



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



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



Transforming the Graphs

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

Remember:

Translate		Reflect	Dilate
$\sqrt{x+1}$	move left 1	$y = -\sqrt{x}$ reflects x axis	$y = 2\sqrt{x}$ vertical stretch
$\sqrt{x-2}$	move right 2		
$\sqrt{x}+3$	up 3	$y = \sqrt{-x}$ reflects y axis	$y = \frac{1}{4}\sqrt{x}$ vertical compression
$\sqrt{x}-4$	down 4		

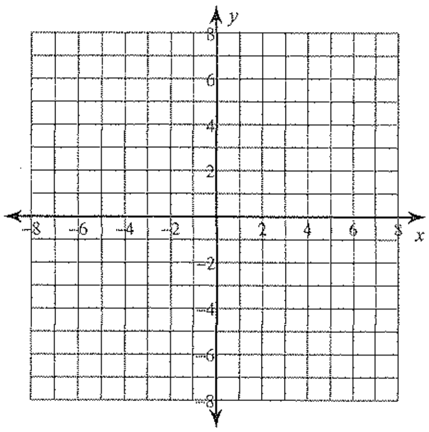
26

Algebra 2 Name____________________

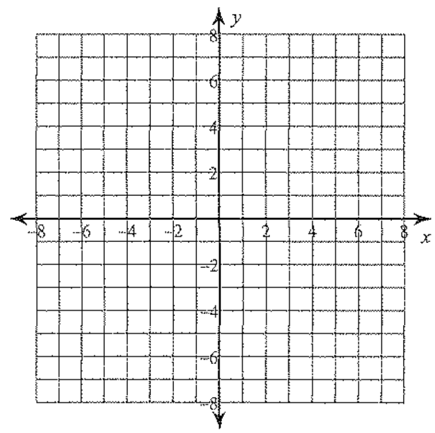
Square Root & Cube Root Guided Pratice

Identify the domain and range of each. Then sketch the graph.

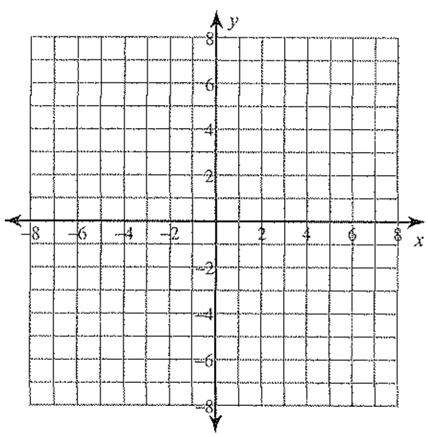
1) $y = 1 + \sqrt{x}$



2) $y = \sqrt{x - 3} - 1$



3) $y = 3\sqrt{x - 4}$



(28)

Common Core 2 Name______________________

Graphing Square and Cube Root Functions

Identify the domain and range of each. Then sketch the graph.

1) $y=\sqrt{x+4}$

2) $y=-\sqrt{x}-3$

3) $y=3+\sqrt{x+3}$

4) $y=-\sqrt{x-1}-3$

5) $y=\sqrt{x}$

6) $y=\sqrt{x-2}+1$

7) $y=\sqrt{x-1}$

8) $y=\sqrt{x-2}+2$

9) $y=3+\sqrt{x-2}$

10) $y=\sqrt{x}+4$

11) $y=-5+\sqrt[3]{x}$

12) $y=\sqrt[3]{x-3}$

13) $y=\sqrt[3]{x}$

14) $y=\sqrt[3]{x+4}$

15) $y=\sqrt[3]{x+3}$

16) $y=\sqrt[3]{x-2}-3$

17) $y=\sqrt[3]{x+3}-1$

18) $y=\sqrt[3]{64x}$

19) $y=\sqrt[3]{x}+5$

20) $y=2\sqrt[3]{x-4}$

30