Name: ______________________________

Unit 6 Study Guide

Square Root Graph

The parent function is $f(x) = \sqrt{x}$

Transformation of square root:

$y = a\sqrt{x-h} + k$

A if a > 0 same as parent
If a < 0 reflect over the x – axis

If a > 1 the graph is STRETCHED
If a < 1 the graph is SHRUNK

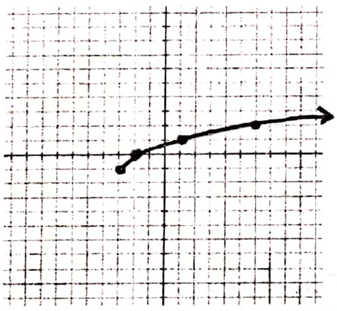
H $\sqrt{x-h}$ move h units RIGHT
$\sqrt{x+h}$ move h units LEFT

K $\sqrt{x}+k$ move k units UP
$\sqrt{x}-k$ move k units DOWN

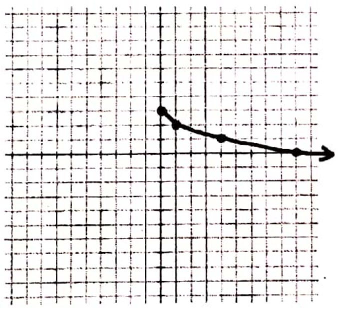
Domain of parent [0, infinity)
Range of parent [0, infinity)

Graph the following:

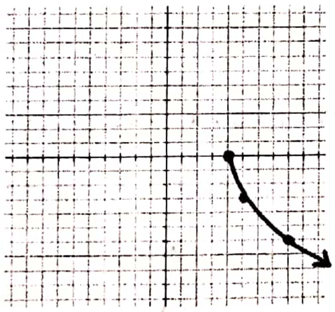
1) $y = \sqrt{x+3} - 1$



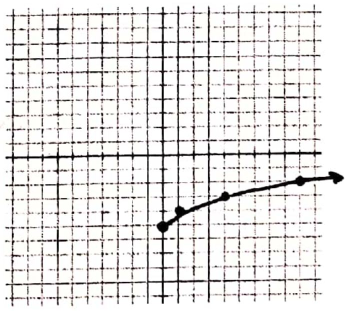
2) $y = -\sqrt{x} + 3$



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



4) $y = \sqrt{+x} - 5$



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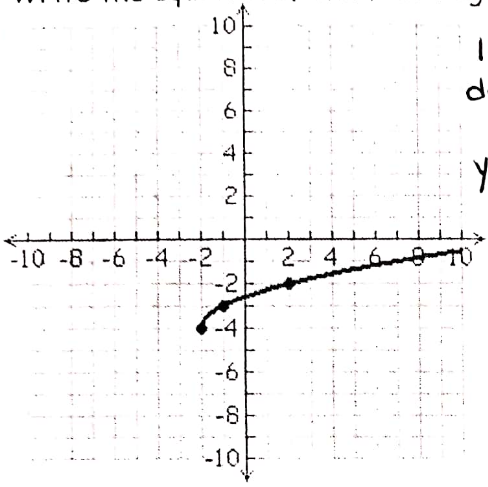
9) Write the equation of the following graphs.

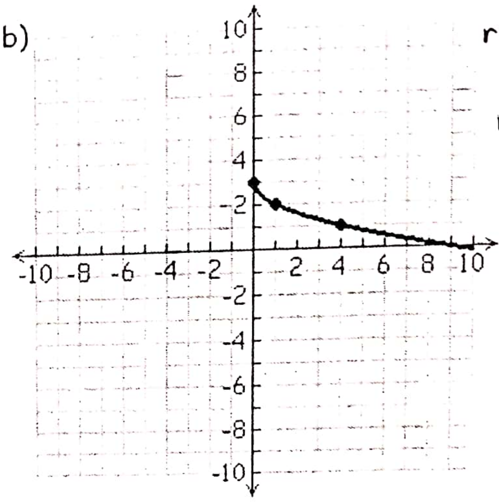
a)



left 2
down 4

$y = \sqrt{x+2} - 4$

b)



reflect
over
x-axis
up 3

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

10) The function $f(x) = \sqrt{x}$ is translated 2 units left and 5 units up. If $g(x)$ represents the transformation of $f(x)$, what is the equation of $g(x)$?

$g(x) = \sqrt{x+2} + 5$

11) Under certain conditions, a skydiver's terminal velocity, V_t (in feet per sec) is given by

$$V_t = 33.7\sqrt{\frac{W}{A}}$$ where W is the weight of the skydiver and A is the

skydiver's cross-sectional surface area (in sq. feet). Note that skydivers can vary their surface area by changing positions as they fall.

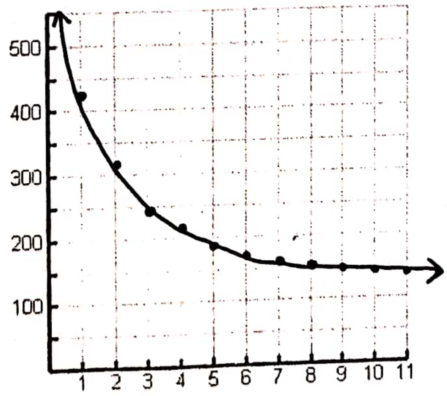
a) Write an equation for a skydiver who weighs 165 pounds.

$V_t = 33.7\sqrt{\frac{165}{A}}$

b) Complete the table of values for the equation from part (a).

A	2	4	6	8	10
V_t	306.095	216.44	176.72	153.05	136.89

c) Use your table to graph the equation.



Unit 6 Study Guide

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Inverse Functions Graph

The parent function is $f(x) = \frac{1}{x}$

Transformations of Inverse Functions:

$y = a\frac{1}{x-h} + k$

A

If a > 0 same as the parent
If a < 0 reflect over the x – axis

If a > 1 the graph is STRETCHED
If a < 1 the graph is SHRUNK

H

$\frac{1}{x-h}$ moves h units RIGHT
$\frac{1}{x+h}$ moves h units LEFT

K

$\frac{1}{x} + k$ moves k units UP
$\frac{1}{x} - k$ moves k units DOWN

Domain of the parent function is (–infinity, 0) U (0, infinity)
Range of the parent function is (–infinity, 0) U (0, infinity)

Identify the transformations:

1) $y = \frac{1}{x-3} + 8$ right 3 up 8
2) $y = \frac{2}{x+5}$ left 5 stretch by 2
3) $y = -\frac{1}{x} - 4$ reflect over x-axis down 4

Write the equation for an inverse function:

1) That is reflected over the x-axis and down 2 $y = -\frac{1}{x} - 2$
2) That has a vertical compression of ⅓ and is shifted right 9 $y = \frac{1}{3} \cdot \frac{1}{x-9}$

Solving Radical Equations

Answers on seperate sheet of paper

Reminder to check for Extraneous Solutions

1) $\sqrt{x-4} = 3$
2) $-8 + \sqrt{5x-5} = -3$
3) $-10\sqrt{x-10} = -60$
4) $\sqrt{3x} = \sqrt{4x-1}$
5) $\sqrt{3x+12} = \sqrt{x+8}$
6) $\sqrt{\frac{x}{10}} = \sqrt{3x-58}$

Direct and Inverse Variation

A Direct Variation is a specific relationship in which there is a constant ratio (y/x) between all ordered pairs.

Direct Variation Equations are written in the form y = Kx

To find missing value use y/x = y/x

An inverse variation is a specific relationship in which there is a constant product (x · y) between all ordered pairs.

Inverse Variation Equations are written in the form y = k/x

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To find missing value use xy = xy

When do we use Direct?

In situations where as one variable **goes up**, the other variable **goes up**.

When do we use Inverse?

In situations where as one variable **goes up**, the other variable **goes down**.

Find the Constant, K, for the Direct Variation:

1) {(1, 4), $\boxed{(2, 8)}$, (3, 12), (4, 16)}

$y = kx$

$\frac{8}{2} = \frac{k(\cancel{2})}{\cancel{2}}$

$\boxed{k = 4 \quad y = 4x}$

2) {(-6, 3), $\boxed{(-4, 2)}$, (0, 0), (2, -1)}

$y = kx$

$\frac{2}{-4} = \frac{k(\cancel{-4})}{\cancel{-4}}$

$\boxed{k = -\frac{1}{2} \quad y = -\frac{1}{2}x}$

3)

x	y
-12	-8
-6	-4
0	0
3	2

$y = kx$

$\frac{-4}{-6} = \frac{k(\cancel{-6})}{\cancel{-6}}$

$\boxed{k = \frac{2}{3} \quad y = \frac{2}{3}x}$

4)

x	-4	-1	3	5
y	12	3	-9	-15

$y = kx$

$\frac{3}{-1} = \frac{k(\cancel{-1})}{\cancel{-1}}$

$\boxed{k = -3 \quad y = -3x}$

Finding the missing values:

Answers on seperate sheet

If the following ordered pairs represent a direct variation, find the missing value.

1) (−2, −4) and (−6, y)
2) (4, 16) and (x, 24)
3) If y = −18 when x = 3, find x when y = 30
4) If y = 10 when x = −4, find y when x = 12

Find the Constant, K, for Inverse Variations:

1) {(1, 20), (2, 10), (4, 5)}

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

$20 = \frac{k}{1}$

$\boxed{k = 20 \quad y = \frac{20}{x}}$

2) {(1, -28), $\boxed{(2, -14)}$, (4, -7)}

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

$2 \cdot -14 = \frac{k}{\cancel{2}} \cdot 2$

$\boxed{k = -28 \quad y = \frac{-28}{x}}$

3)

x	y
-5	2.4
-3	4
-2	6
-1	12

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

$-3 \cdot 4 = \frac{k}{\cancel{(-3)}} \cdot -3$

$\boxed{-12 = k \quad y = \frac{-12}{x}}$

4)

x	-0.5	-1	-1.5	-2
y	-12	-6	-4	-3

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

$-1 \cdot -6 = \frac{k}{\cancel{-1}} \cdot -1$

$\boxed{6 = k \quad y = \frac{6}{x}}$

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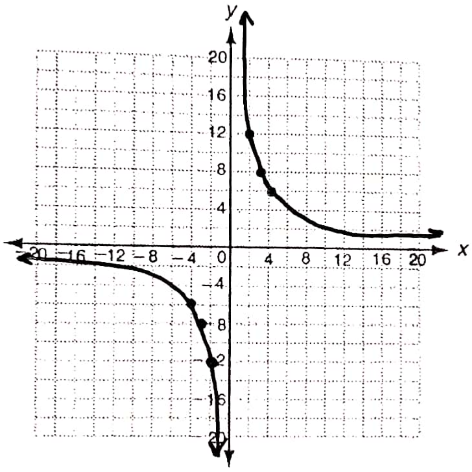
Graph Inverse Variations:

More Examples

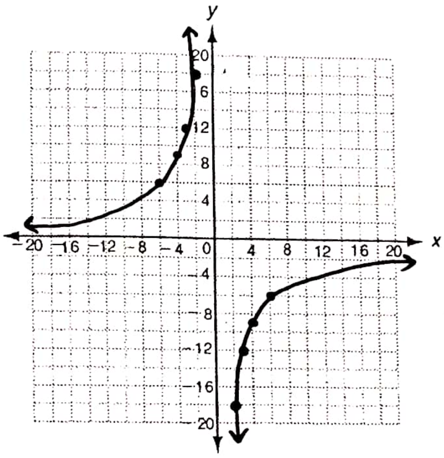
Graph the equations below by creating a table of values.

5) Constant of Variation: 24

24
1, 24
2, 12
3, 8
4, 6
-1 -24
-2 -12
-3 -8
-4 -6



6) Constant of Variation: -36



-36
-1, 36
-2, 18
-3, 12
-4, 9
-6, 6
1, -36
2, -18
3, -12
4, -9
6, -6

Find the Missing Values

If the following ordered pairs represent a inverse variation, find the missing value.

1) (12, 14) and (−24, y)
2) (x, −7) and (21, −3)
3) If y = 9 when x = −6, find x when y = 3
4) If y = − 8 when x = −7, find y when x = −4

1) (12,14) (-24, y)

$xy = xy$

$(12)(14) = -24y$

$\frac{168}{-24} = \frac{-\cancel{24}y}{-\cancel{24}}$

$\boxed{y = -7}$

2) (x, -7) (21, -3)

$-7x = 21(-3)$

$\frac{-\cancel{7}x}{-\cancel{7}} = \frac{-63}{-7}$

$\boxed{x = 9}$

3) If y=9 when x=-6 find x when y=3

$(9)(-6) = 3x$

$\frac{-54}{3} = \frac{\cancel{3}x}{\cancel{3}}$

$\boxed{x = -18}$

4) If y=-8 when x=-7 find y when x=-4

$(-8)(-7) = -4y$

$\frac{56}{-4} = \frac{-\cancel{4}y}{-\cancel{4}}$

$\boxed{y = -14}$

Solving Radical Equations

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

$(\sqrt{x-4})^2 = (3)^2$

$x - \cancel{4} = 9$

$\cancel{+4} \qquad +4$

$\boxed{x = 13}$

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

$\cancel{+8} \qquad\qquad +8$

$(\sqrt{5x-5})^2 = (5)^2$

$5x - \cancel{5} = 25$

$\cancel{+5} \qquad +5$

$\frac{\cancel{5}x}{\cancel{5}} = \frac{30}{5}$

$\boxed{x = 6}$

3) $\frac{-\cancel{10}\sqrt{x-10}}{-\cancel{10}} = \frac{-60}{-10}$

$(\sqrt{x-10})^2 = (6)^2$

$x - \cancel{10} = 36$

$\cancel{+10} \qquad +10$

$\boxed{x = 46}$

4) $(\sqrt{3x})^2 = (\sqrt{4x-1})^2$

$3x = \cancel{4x} - 1$

$-4x \qquad -\cancel{4x}$

$\frac{\cancel{-}x}{\cancel{-1}} = \frac{-1}{-1}$

$\boxed{x = 1}$

5) $(\sqrt{3x+12})^2 = (\sqrt{x+8})^2$

$3x + 12 = \cancel{x} + 8$

$-x \qquad -\cancel{x}$

$2x + \cancel{12} = 8$

$-\cancel{12} \qquad -12$

$\frac{\cancel{2}x}{\cancel{2}} = \frac{-4}{2}$

$\boxed{x = -2}$

6) $\left(\sqrt{\frac{x}{10}}\right)^2 = \left(\sqrt{3x-58}\right)^2$

$\cancel{10}\,\frac{x}{\cancel{10}} = (3x-58)10$

$x = 30x - 580$

$-30x \qquad -\cancel{30x}$

$\frac{-29x}{-29} = \frac{-580}{-29}$

$\boxed{x = 20}$

Finding Missing Values:

1) $(-2,-4)$ and $(-6,y)$

$\frac{-4}{-2} = \frac{y}{-6}$

$\frac{-\cancel{2}y}{-\cancel{2}} = \frac{24}{-2}$

$\boxed{y = -12}$

2) $(4,16)$ and $(x,24)$

$\frac{16}{4} = \frac{24}{x}$

$\frac{\cancel{16}x}{\cancel{16}} = \frac{96}{16}$

$\boxed{x = 6}$

3) If $y=-18$ when $x=3$ find x when $y=30$

$\frac{-18}{3} = \frac{30}{x}$

$\frac{-\cancel{18}x}{-\cancel{18}} = \frac{90}{-18}$

$\boxed{x = -5}$

4) If $y=10$ and $x=-4$ find y when $x=12$

$\frac{10}{-4} = \frac{y}{12}$

$\frac{-\cancel{4}y}{-\cancel{4}} = \frac{120}{-4}$

$\boxed{y = -30}$