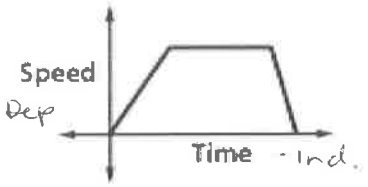
Transformations Unit – Interpreting Graphs WS#1 Name: Key

Identify the independent and dependent variables for each relation, and then describe what is happening in each graph.

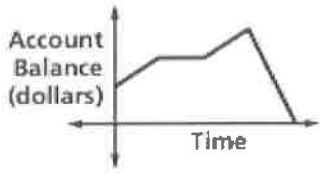
8/9

1. The graph represents the speed of a car as it travels to the grocery store.



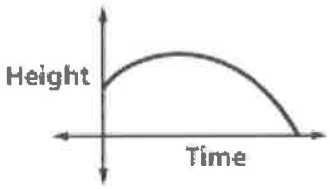
y-int: car is stopped.

2. The graph represents the balance of a savings account over time.



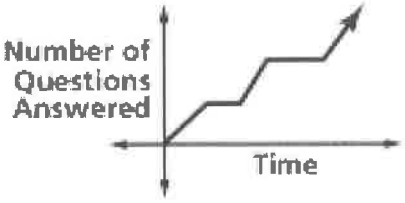
y-int: amt deposited

3. The graph represents the height of a baseball after it is hit.



y-int: height of bat/player

4. The graph below represents a student taking an exam.



y-int: at 0 time, no questions answered yet

5. Describe the pattern of the graph of each of the following situations as the graphs are read from left to right as increasing, decreasing, increasing and then decreasing, or decreasing and then increasing.

   a. The height of a child at birth and on each birthday from age 1 to age 6

   Increasing Indvar: age dep. height
   Y-int: height when born

   b. The balance that is due on a home mortgage from the date the house was purchased until it was sold 8 years later

   Indvar: dates of payment (time)
   depvar: $ owed
   Decreasing y-int: original cost of house.

   c. The height of a ball that is thrown upward from the top of a building from the time it is thrown until it hits the ground

   Increasing then decreasing. Ind. var: time
   depvar: height
   Yint: height thrown from – persons height

   d. The monthly electric bill for August of one year to July of the next year for a family living in Atlanta, Georgia, in a home with central air conditioning. (Assume that July and August are the hottest months and that the family uses natural gas for heating.)

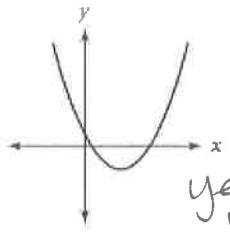
   y-int: heat used in Aug.
   Decreasing then increasing.
   no electric to heat.
   Ind: Time (months)
   Dep: electricity used
   8 9 10 11 12 1 2 3 4 5 6 7

6. For each of the situations described in Exercise 1-5, describe the real-world meaning of the vertical intercept (y-intercept) of the graph, and the domain and range in context.

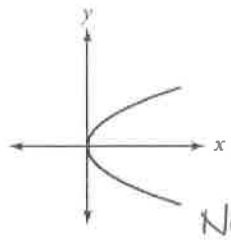
Transformations Unit – Interpreting Graphs WS#1 Name: Key

Function Notation

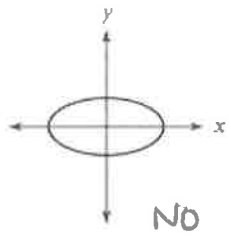
1. Determine whether or not each graph represents a function. Explain how you know.

a. 

yes VLT

b. 

NO VLT

c. 

NO VLT

2. Find each of the indicated function values.

a. If $f(x) = -\sqrt{4x+1}$, find $f\left(-\frac{1}{4}\right)$, $f(0)$, $f(0.75)$, $f(2)$, and $f(12)$.

b. If $f(x) = -x^2 + 3x + 5$, find $f(-3)$, $f(0)$, $f(2)$, $f(5)$, and $f(8)$.

c. If $f(x) = \frac{2}{x-4}$, find $f(-4)$, $f(0)$, $f(5)$, $f(8)$, and $f(24)$.

(a) $f\left(-\frac{1}{4}\right) = -\sqrt{4\left(-\frac{1}{4}\right)+1} = 0$

$-\sqrt{-1+1}$

-0

$f(0) = -\sqrt{0+1} = -1$

$f(.75) = -\sqrt{4(.75)+1}$

$= -\sqrt{4} = -2$

$f(2) = -\sqrt{4(2)+1}$

$= -\sqrt{9} = -3$

$f(12) = -\sqrt{4(12)+1} =$

$-\sqrt{49}$ -7

(b) $f(-3) = -13$

$f(0) = 5$

$f(2) = 7$

$f(5) = -5$

$f(8) = -36$

(c) $f(-4) = -\frac{1}{4}$

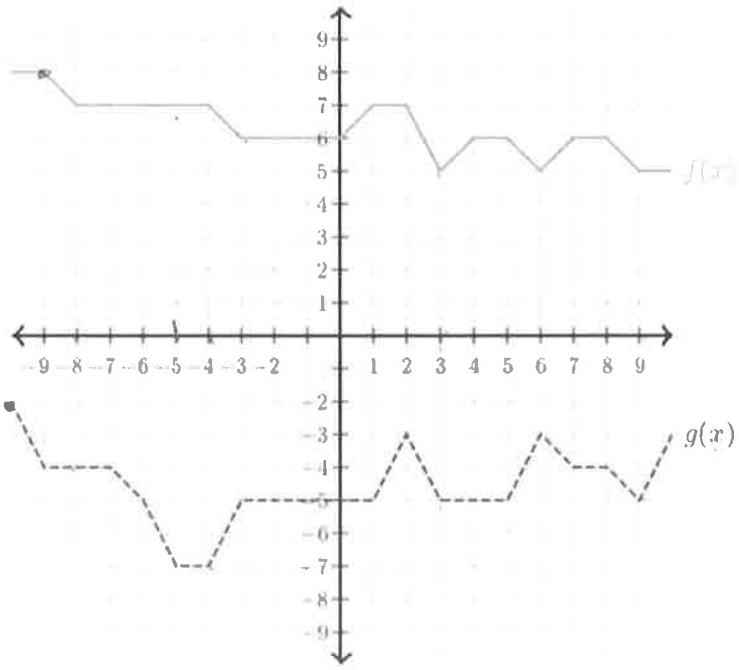
$f(0) = -\frac{1}{2}$

$f(5) = 2$

$f(8) = \frac{1}{2}$

$f(24) = \frac{1}{10}$

3. Use the graph below to find each of the following.



a. $f(3) = +5$	b. $g(3) + g(-4)$ $-5 + -7 = -12$	c. $f(-3) + g(2)$ $6 + -3 = 3$
d. x *when* $f(x) = 8$ $x = -9$	e. x *when* $g(x) = -2$ $x = -10$	f. $2 \cdot f(-4) - 3 \cdot g(9)$ $2(7) - 3(-5) = 29$
g. $3 + g(9)$ $3 + -5 = -2$	h. $4 - f(-5)$ $4 - 7 = -3$	i. $\sqrt{g(-8)}$ $\sqrt{-4} = 2i$

Translations and the Quadratic Family WS#2

Name _____ Period _____ Date _____

1. Describe the translations of the graph of $y = x^2$ needed to produce the graph of each equation.

a. $y = x^2 - 6$ **b.** $y = (x + 5)^2$ **c.** $y = x^2 + 2.5$

d. $y = (x - 10)^2$ **e.** $y = (x - 3)^2 - 9$ **f.** $y = (x + 7.5)^2 + 2.5$

2. Find the vertex of each parabola.

a. $y = x^2$ **b.** $y = x^2 + 3$ **c.** $y = x^2 - 4$

d. $y = (x - 2)^2$ **e.** $y = (x + 3)^2$ **f.** $y = (x + 1)^2 + 5$

g. $y = (x - 4)^2 - 10$ **h.** $y = 4 + (x - 7)^2$ **i.** $y = -8 + (x + 5)^2$

3. Each parabola described is the graph of $y = x^2$. Write an equation for each parabola and sketch its graph.

a. The parabola is translated left 3 units.

b. The parabola is translated up 1 unit.

c. The parabola is translated right 5 units.

d. The parabola is translated down 4 units.

e. The parabola is translated left 4 units and up 2 units.

f. The parabola is translated right 2 units and down 3 units.

4. Describe what happens to the graph of $y = x^2$ in the following situations.

a. y is replaced with $(y + 1)$. **b.** x is replaced with $(x - 5)$.

c. x is replaced with $(x + 3)$. **d.** y is replaced with $(y - 6)$.

5. Solve.

a. $x^2 = 49$ **b.** $x^2 + 6 = 31$ **c.** $x^2 - 12 = 52$

d. $(x + 4)^2 = 81$ **e.** $(x - 3)^2 = 100$ **f.** $(x + 7)^2 = 144$

g. $x^2 = 17$ **h.** $x^2 - 11 = 19$ **i.** $(x + 2)^2 = 13$

j. $(x + 4)^2 - 5 = 31$ **k.** $14 + (x + 12)^2 = 35$ **l.** $-20 + (x - 5)^2 = 3$

WS#2 KEY

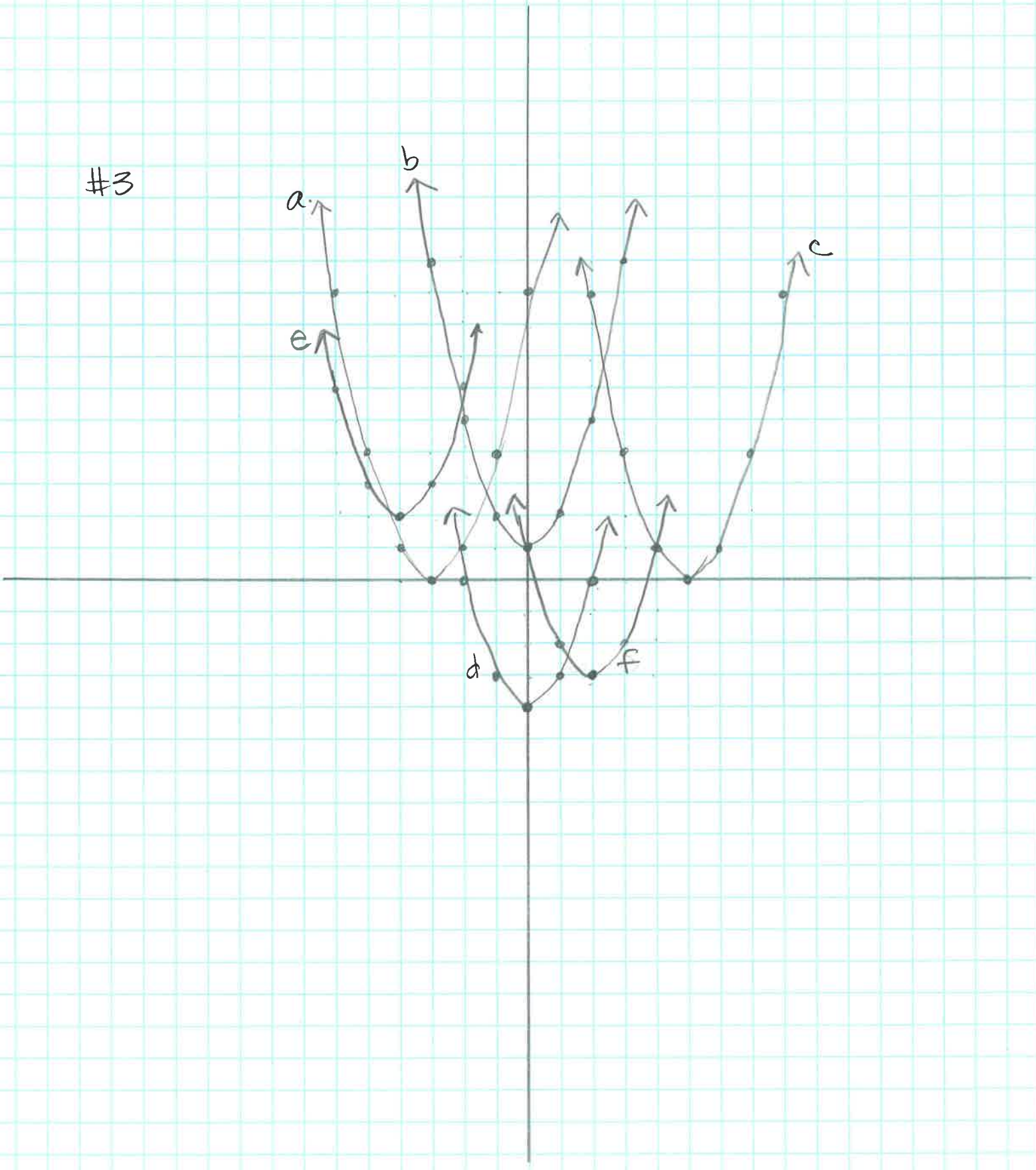
1. a. $y = x^2 - 6$
   moved down six
   b. $y = (x+5)^2$
   moved left five
   c. $y = x^2 + 2.5$
   moved up 2.5
   d. $y = (x-10)^2$
   moved right 10
   e. $y = (x-3)^2 - 9$
   moved right three
   moved down nine
   f. $y = (x+7.5)^2 + 2.5$
   moved left 7.5 and up 2.5

2. a. $y = x^2$ $(0,0)$
   b. $y = x^2 + 3$ $(0,3)$
   c. $y = x^2 - 4$ $(0,-4)$
   d. $y = (x-2)^2$ $(2,0)$
   e. $y = (x+3)^2$ $(-3,0)$
   f. $y = (x+1)^2 + 5$ $(-1,5)$
   g. $y = (x-4)^2 - 10$ $(4,-10)$
   h. $y = 4 + (x-7)^2$ $(7,4)$
   i. $y = -8 + (x+5)^2$ $(-5,-8)$

3. a. $y = (x+3)^2$
   b. $y = x^2 + 1$
   c. $y = (x-5)^2$
   d. $y = x^2 - 4$
   e. $y = (x+4)^2 + 2$
   f. $y = (x-2)^2 - 3$

4. a. $y + 1 = x^2$
   $-1 \quad -1$
   $y = x^2 - 1$
   Down 1
   b. $y = (x-5)^2$
   Right 5
   c. $y = (x+3)^2$
   Left 3
   d. $y - 6 = x^2$
   $+6 \quad +6$
   $y = x^2 + 6$
   up 6

#3



5. a. $\sqrt{x^2} = \sqrt{49}$

$\boxed{x = \pm 7}$

b. $x^2 + 6 = 31$

$-6 \quad -6$

$\sqrt{x^2} = \sqrt{25}$

$x = \pm 5$

c. $x^2 - 12 = 52$

$+12 \quad +12$

$\sqrt{x^2} = \sqrt{64}$

$x = \pm 8$

d. $\sqrt{(x+4)^2} = \sqrt{81}$

$x + 4 = \pm 9$

$x + 4 = 9 \qquad x + 4 = -9$

$-4 \quad -4 \qquad -4 \quad -4$

$\boxed{x = 5 \qquad x = -13}$

e. $\sqrt{(x-3)^2} = \sqrt{100}$

$x - 3 = \pm 10$

$x - 3 = 10 \qquad x - 3 = -10$

$\boxed{x = 13 \qquad x = -7}$

f. $\sqrt{(x+7)^2} = \sqrt{144}$

$x + 7 = \pm 12$

$-7 \quad -7$

$\boxed{x = 5 \quad x = -19}$

l. $-20 + (x-5)^2 = 3$

$+20 \qquad +20$

$\sqrt{(x-5)^2} = \sqrt{23}$

$x - 5 = \pm\sqrt{23}$

$x = 5 + \sqrt{23} \quad x = 5 - \sqrt{23}$

g. $\sqrt{x^2} = \sqrt{17}$

$x = \pm\sqrt{17}$

n. $x^2 - 11 = 19$

$+11 \quad +11$

$\sqrt{x^2} = \sqrt{30}$

$\boxed{x = \pm\sqrt{30}}$

30
3 10
2 15

i. $\sqrt{(x+2)^2} = \sqrt{13}$

$x + 2 = \pm\sqrt{13}$

$-2 \quad -2$

$x = -2 + \sqrt{13}$

$x = -2 - \sqrt{13}$

j. $(x+4)^2 - 5 = 31$

$+5 \quad +5$

$\sqrt{(x+4)^2} = \sqrt{36}$

$x + 4 = \pm 6$

$\boxed{x = 2 \quad x = -10}$

k. $14 + (x+12)^2 = 35$

$-14 \qquad -14$

$\sqrt{(x+12)^2} = \sqrt{21}$

$x + 12 = \pm\sqrt{21}$

$-12 \quad -12$

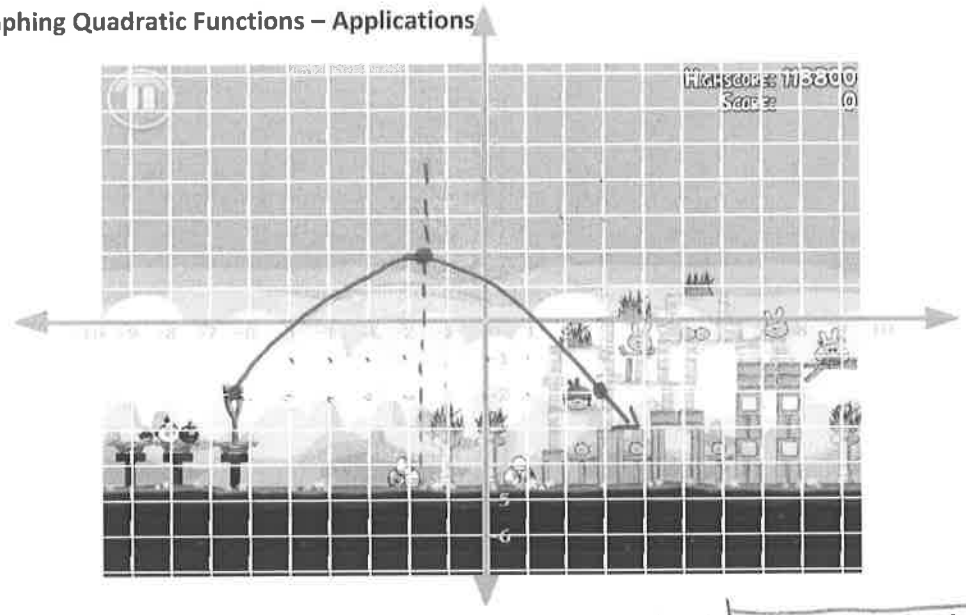
$x = -12 + \sqrt{21}$

$x = -12 - \sqrt{21}$

WS#2

Graphing Quadratic Functions – Applications

1.



A. Draw a path for the bird that would hit the target (Pigs). Write an equation for the path.

We did not go over when a ≠ 1

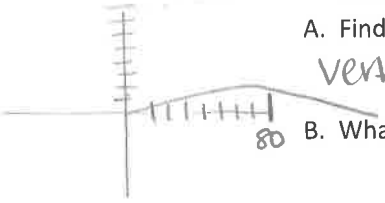
B. Describe a reasonable domain and range for your function.

D: $-7 < x < 4$ R: $-2 \leq y \leq 2$

C. Compare the domain and range for this function to the domain and range of $f(x)=x^2$.

Out of context all values could be used for x. In this situation the range is restricted by max & ground.

2. Although the playing surface of a football or soccer field appears to be flat, its surface is actually shaped like a parabola so that rain runs off to either side. The cross section of a field with synthetic turf can be modeled by $f(x)=-0.000234(x-80)^2+1.5$ where x and y are measured in feet.



A. Find the width of the field. If 80 ft is middle, the field is 160 ft wide

Vertex (80, 1.5) ft ft

B. What is the maximum height of the field?

1.5 ft

C. Explain how the width and height relate to domain and range.

Domain is the width $0 < x < 160$ ft

Range is $0 \leq y \leq 1.5$ (height)

3. The average gas mileage *m* in miles per gallon for a compact car is modeled by $m(s)=-0.015(s-47)^2+33$, where *s* is the car's speed in miles per hour. The average gas mileage for an SUV is modeled by $m_y(s)=-0.015(s-47)^2+15$. What kind of transformation describes this change and what does this transformation mean?

(47, 33) (s, m(s)) (47, 15)

↑ speed ↑ mpg ↑ speed ↑ mpg

This is a vertical shift, they both are the same speed but get different mpg.

Reflections and the Square Root Family WS#3

Name key Period _____ Date _____

1. Describe what happens to the graph of $y = \sqrt{x}$ in each of the following situations.

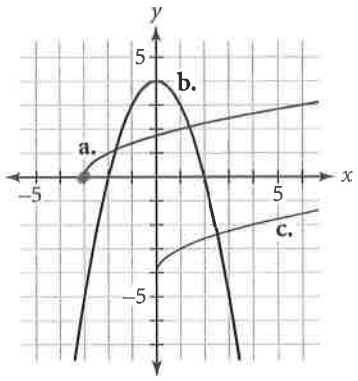
a. x is replaced with $(x + 6)$. Left 6

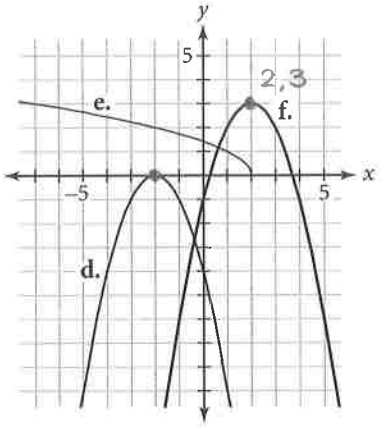
b. y is replaced with $(y - 5)$. up 5

c. y is replaced with $(y + 1)$. Down 1

d. x is replaced with $(x - 8)$. Right 8

2. Each graph below is a transformation of the graph of either the parent function $y = x^2$ or the parent function $y = \sqrt{x}$. Write an equation for each graph.





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

b. $y = -x^2 + 4$

c. $y = \sqrt{x} - 4$

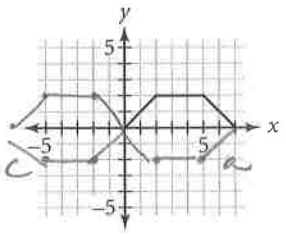
d. $y = -(x+2)^2$

e. $y = \sqrt{-(x-2)}$

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

3. Given the graph of $y = f(x)$, draw a graph of each of these related functions.

a. $y = -f(x)$ vertical Flip b. $y = f(-x)$ Horizontal c. $y = -f(-x)$ BOTH.



b

4. Solve each equation for y to get two separate functions that could be entered into a graphing calculator. In each case, label the equations as Y1 and Y2. Then combine both functions to create a single relation that involves x and y.

a. $\sqrt{(y+2)^2} = \sqrt{x}$ b. $\sqrt{y^2} = \sqrt{x+2}$ c. $\sqrt{(y+1)^2} = \sqrt{x-6}$

a. $y + 2 = \pm\sqrt{x}$
$-2 \quad -2$
$y = \sqrt{x} - 2$
$y = -\sqrt{x} - 2$

b. $y = \pm\sqrt{x+2}$

c. $y + 1 = \pm\sqrt{x-6}$
$y = \sqrt{x-6} - 1$
$y = -\sqrt{x-6} - 1$

5. Use the function $h = -4.9t^2 + d$ to answer each question. (Round your answers to the nearest tenth of a second.)

a. If a ball is dropped from a height of 500 meters, how long will it take the ball to reach a height of 200 meters? About 7.8 sec

b. If a ball is dropped from a height of 175 meters, how long will it take the ball to reach a height of 50 meters?

c. If a ball is dropped from a height of 90 meters, how long will it take the ball to hit the ground?

repeat same process

a. $h = -4.9t^2 + 500$ $h = 200$

$200 = -4.9t^2 + 500$

$-300 = -4.9t^2$ $\sqrt{t^2} = \sqrt{61.22}$

$t = \pm 7.82$

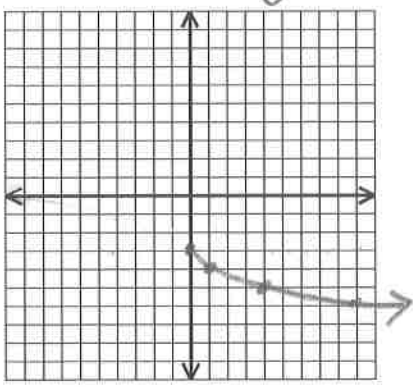
WS#3

Reflections and the Square Root Family

Name: Key

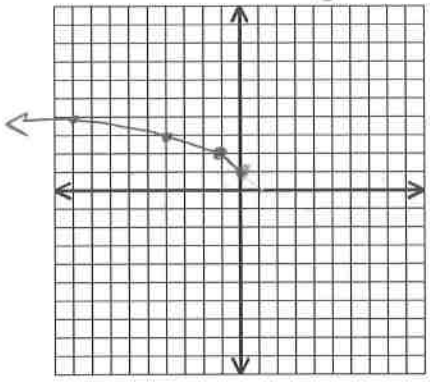
Graph each function.

6. $h(x) = -\sqrt{x} - 3$
D: $x \geq 0$ R: $y \leq -3$



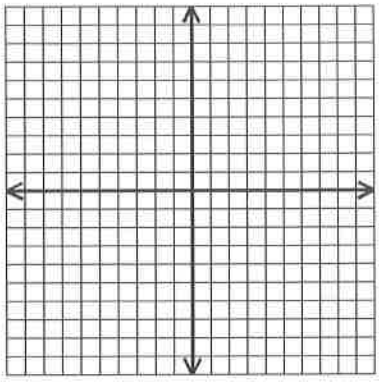
(0,-3) vertical FLIP

7. $f(x) = \sqrt{-x} + 1$
D: $x \leq 0$ R: $y \geq 1$



(0,1) horizontal flip

8. $g(x) = 2 - \sqrt{x}$
D: _____ R: _____



Write the equation for each of the following.

9. Start with the graph of $f(x) = \sqrt{x}$. Shift it 2 units to the right and 1 unit down.

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

10. Start with the graph of $f(x) = \sqrt{x}$. Shift it 5 units down.

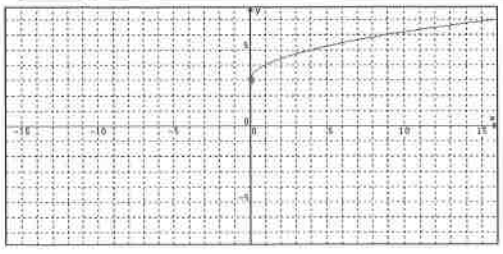
_____

11. Start with the graph of $f(x) = \sqrt{x}$. Reflect it across the x-axis.

_____

12. Start with the graph of $f(x) = \sqrt{x}$. Give it a vertical reflection (outside) and shift it four units left (inside), and five units down. (outside)

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



15. _____