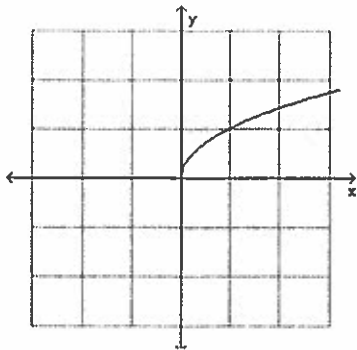**Transformations Worksheet**
Precalculus

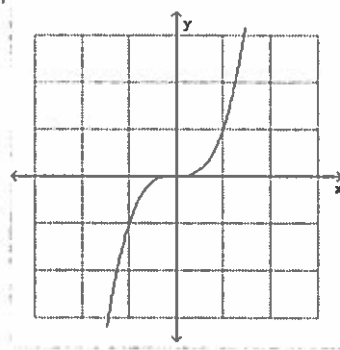Name: **KEY**   Date: _____

1. Use the graph to name the function..
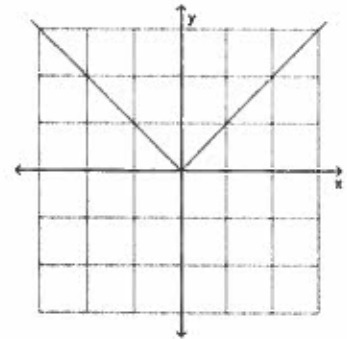
a.

Function: _Square root_
$$f(x) = \sqrt{x}$$

b.

Function: _Cubic_
$$f(x) = x^3$$

c.

Function: _absolute value_
$$f(x) = |x|$$

2. Describe how to transform the graph of f into the graph of g.

a. $f(x) = \sqrt{x}$ and $g(x) = 3\sqrt{x}$

Vertical stretch by a factor of 3.

b. $f(x) = \sqrt{x}$ and $g(x) = -\sqrt{-x}$

Reflection about the y-axis and the x-axis

c. $f(x) = x^5$ and $g(x) = (8x)^5$

Horizontal shrink by a factor of 8.

d. $f(x) = |x|$ and $g(x) = -|x+2| - 3$

Reflection about the x-axis, Left 2 units, down 3 units

3. Write an equation for the function that is described by the given characteristics.

a. The shape of $f(x) = \sqrt{x}$, but moved two units to the right and eight units downward.

$$g(x) = \sqrt{x-2} - 8$$

b. The shape of $f(x) = x^2$ reflected over the x-axis and vertically stretched by a factor of 6.

$$g(x) = -6x^2$$

c. The shape of $f(x) = |x|$, but moved 5 units upward and reflected about the y-axis.

$$g(x) = |-x| + 5$$

d. The shape of $f(x) = \frac{1}{x}$ horizontally shrunk by a factor of 2 and shifted up 3 units.

$$g(x) = \frac{1}{2x} + 3$$

e. The shape of $f(x) = x^3$, but moved six units to the left, six units downward and reflected about the x-axis.

$$g(x) = -(x+6)^3 - 6$$

Name **Key**

Period _____ Date _____

$$\begin{pmatrix} inside \\ = horizontal \\ = LIES \end{pmatrix} \quad \begin{matrix} ouside \\ = vertical \\ = TRUTH \end{matrix}$$

add or subract = translation (or shift or slide)
multiplication by a negative = reflection
multiplication by a number = stretch or shrink

Describe the transformations of $f(x)$ for the following functions.

1. $f(x) = x^2$ to $g(x) = x^2 - 7$

   __Vertical shift down 7__

2. $f(x) = x^2$ to $g(x) = (x+4)^2$

   __horizontal shift 4 units left__

3. $f(x) = x^3$ to $g(x) = -x^3$

   __reflect about the x-axis__

4. $f(x) = x^5$ to $g(x) = (-x+2)^5$

   __reflect about the y-axis and left 2 units__

5. $f(x) = \sqrt{x}$ to $g(x) = 2\sqrt{x-1}$

   __Vertical stretch by a factor of 2 and 1 unit right__

6. $f(x) = |x|$ to $g(x) = -\frac{1}{4}|x|$

   __reflect about the x-axis and vertical shrink by a factor of ¼__

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

   __reflect @ y-axis, horiz. shrink by a factor of 3, right 2, up ⅖ or 0.4__

8. $f(x) = \sqrt[3]{x}$ to $g(x) = \sqrt[3]{\frac{1}{5}x} + 20$

   __horiz stretch by 5 and up 20__

9. $f(x) = x$ to $g(x) = -6x + 3$

   __reflect over x-axis, vertical stretch by 6 up 3 units__

10. $f(x) = x^{45}$ to $g(x) = -(6x + .90)^{45} - 1000$

   reflect over x-axis
   horiz. shrink by factor of 6
   left .90 units, down 1000

Write the function g(x) that is created by transforming f(x), given the description.

11. $f(x) = x^2$; shifted 3 units right and shifted 4 units up.

$$g(x) = (x-3)^2 + 4$$

12. $f(x) = |x|$; reflected vertically and shrunk horizontally by a factor of 2.

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

13. $f(x) = \sqrt{x}$; shrunk vertically by a factor of 3, reflected horizontally and shifted 9 units left.

$$g(x) = \frac{1}{3}\sqrt{-x+9}$$

14. $f(x) = x^3$; shifted 1.2 units down, reflected vertically, reflected horizontally and stretched vertically by a factor of 7.

$$g(x) = -7(-x)^3 - 1.2$$

15. $f(x) = \sqrt[3]{x}$; stretched vertically by a factor of 2, stretched horizontally by a factor of 2, shifted left 2 units and shifted 2 units down.

$$g(x) = 2\sqrt[3]{\frac{x}{2}+2} - 2$$