§ 3.5 Graphing Techniques: Transformations (Graphing Rules)

Shifting Graphs (Rigid Translations) - given a function $y = f(x)$ and $c > 0$

(1) the graph of $y = f(x) + c$ is the graph of $y = f(x)$ shifted up c units.

(2) the graph of $y = f(x) - c$ is the graph of $y = f(x)$ shifted down c units.

(3) the graph of $y = f(x + c)$ is the graph of $y = f(x)$ shifted left c units.

(4) the graph of $y = f(x - c)$ is the graph of $y = f(x)$ shifted right c units.

Example 1:   Graph.

a.) $y = |x| + 2$ b.) $y = |x| - 2$

c.) $y = |x + 2|$ d.) $y = |x - 2|$

Reflecting Graphs - given a function y = f(x)

(1) the graph of y = - f(x) is the graph of y = f(x) reflected over the x-axis.
(2) the graph of y = f(-x) is the graph of y = f(x) reflected over the y-axis.

Example 2: Graph. a.) $y = -\sqrt{x}$ b.) $y = \sqrt{-x}$

Narrowing and Broading (Non-Rigid Translations):

The graph of g(x) = c * f(x) has the same general shape as the graph of f(x).
   1) It is narrowed vertically compared to the graph of f(x) if c > 1.
   2) It is broadened vertically compared to the graph of f(x) if 0 < c < 1.

Example 3: Graph. a.) $y = 5|x|$ b.) $y = \dfrac{1}{2}|x|$

(Note: when an equation contains more than one shifting or reflecting rule, use steps (one rule at a time) and work from the inside of the function to the outside.)