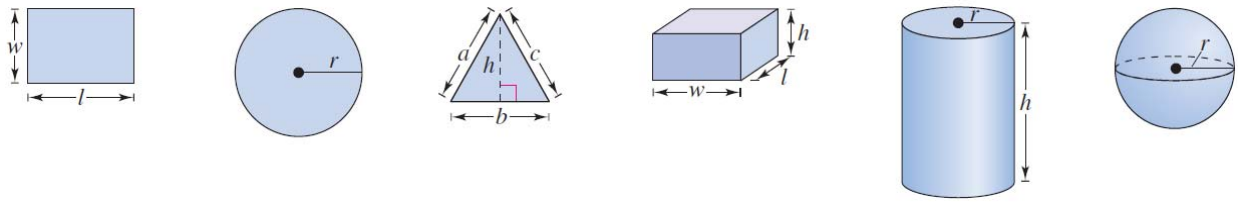
Chapter 1 Summary Sheet

Common Formulas for Area *A*, Perimeter *P*, Circumference *C*, and Volume *V*

Rectangle	*Circle*	*Triangle*	*Rectangular Solid*	*Circular Cylinder*	*Sphere*
$A = lw$	$A = \pi r^2$	$A = \frac{1}{2}bh$	$V = lwh$	$V = \pi r^2 h$	$V = \frac{4}{3}\pi r^3$
$P = 2l + 2w$	$C = 2\pi r$	$P = a + b + c$			



Distance Formula

$$d = \sqrt{(x_1 - x_2)^2 + (y_1 - y_2)^2}$$

Midpoint Formula

$$M\left(\frac{x_1 + x_2}{2}, \frac{y_1 + y_2}{2}\right)$$

Equation of a Circle

$$(x - h)^2 + (y - k)^2 = r^2$$

CenterL (h,k) Radius: r

Slope Formula

$$m = \frac{y_1 - y_2}{x_1 - x_2}$$

Slope-Intercept Form

$$y = mx + b$$

Parallel Lines

Equal Slopes

$$m_1 = m_2$$

Perpendicular Lines

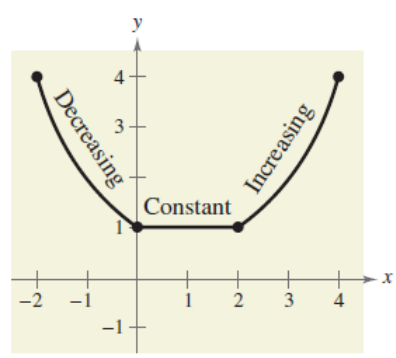
Opposite Reciprocals

$$m_1 = \frac{a}{b} \rightarrow m_2 = -\frac{b}{a} \quad \text{OR} \quad m_1 \bullet m_2 = -1$$

Domain is the set of all x-values. **Range** is the set of all y-values.

An equation is a function $f(x)$ if its graph passes the **Vertical Line Test.** You could also say that an equation is a function if it is one-to-one. Meaning that for every x-value there is a unique corresponding y-value. In other words, for every input there is one output.

y is known as the **dependen**t variable and x the **independent** variable.



Sum, Difference, Product, and Quotient Functions

$$(f + g)(x) = f(x) + g(x) \qquad (f - g)(x) = f(x) - g(x)$$

$$(fg)(x) = f(x) \bullet g(x) \qquad \left(\frac{f}{g}\right)(x) = \frac{f(x)}{g(x)}$$

Composite Functions

$$(f \circ g)(x) = f\left(g(x)\right)$$

Direct Variation: $y = kx$ **Joint Variation:** $z = kxy$ **Inverse Variation:** $y = \frac{k}{x}$

A function has an inverse $f^{-1}(x)$ if its graph passes the **Horizontal Line Test**

The inverse of a function is simply the switching of all ordered pairs.

To determine the **inverse** of a function, **<u>switch</u>** the variables.

The graph of the inverse of a function is reflected about the line y = x.

Important:

$f^{-1}(x)$ is inverse notation.

$$f^{-1}(x) \neq \frac{1}{f(x)}$$

Parent Functions and Their Transformations

1st Shift: Inside – Shift opposite horizontal **Outside –** Shift vertical **2nd Reflect: Negative Outside –** Reflect over horizontal line **Negative Inside –** Reflect over vertical line

For $f(x) = c \cdot g(x)$ **1)** If c > 1, then Vertical stretch **2)** If 0 < c < 1, then vertical shrink. For $f(x) = g(cx)$ **1)** If c > 1, then horizontal shrink **2)** If 0 < c < 1, then horizontal stretch.

Quadratic Function (Parabola) $y = a(x-h)^2 + k$

Parent Function $f(x) = x^2$

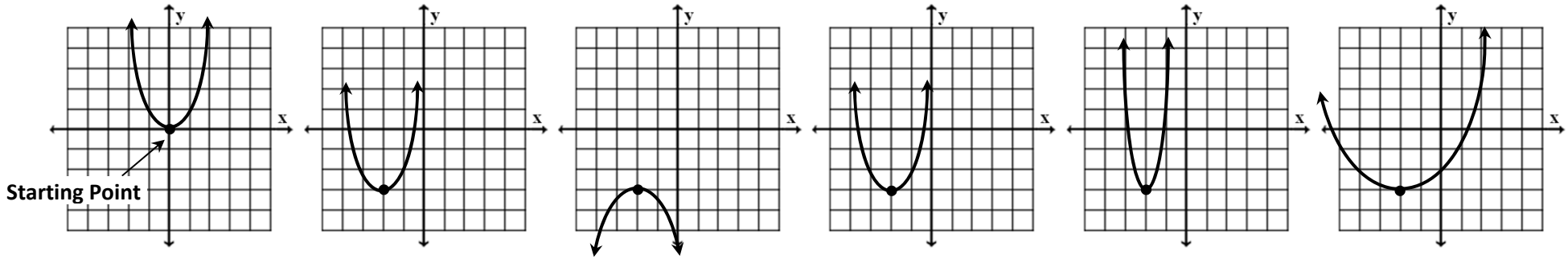
Shift $f(x) = (x+2)^2 - 3$

Shift and Horizontal Reflection $f(x) = -(x+2)^2 - 3$

Shift and Vertical Reflection $f(x) = (-(x+2))^2 - 3$

Shift and Vertical Stretch $f(x) = 5(x+2)^2 - 3$

Shift and Vertical Shrink $f(x) = \frac{1}{5}(x+2)^2 - 3$



Absolute Value Function (V-Shaped) $y = a|x-h| + k$

Parent Function $f(x) = |x|$

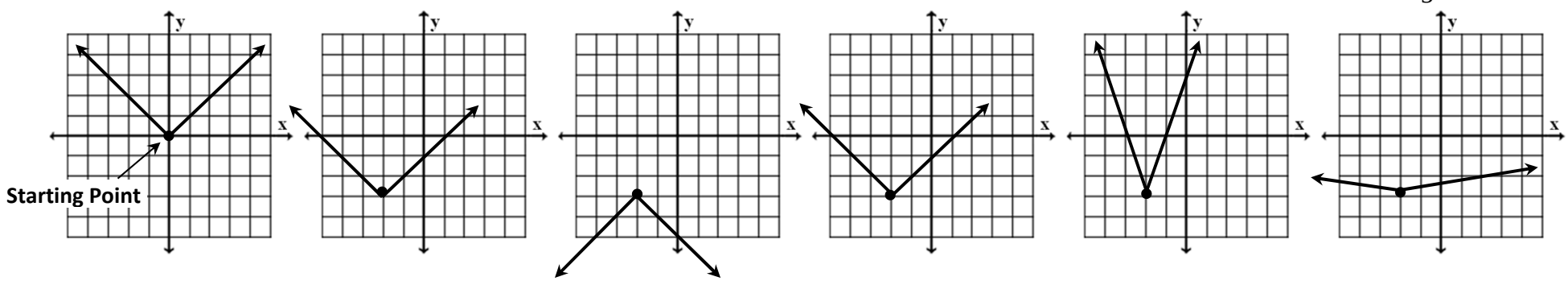
Shift $f(x) = |x+2| - 3$

Shift and Horizontal Reflection $f(x) = -|x+2| - 3$

Shift and Vertical Reflection $f(x) = |-(x+2)| - 3$

Shift and Vertical Stretch $f(x) = 5|x+2| - 3$

Shift and Vertical Shrink $f(x) = \frac{1}{5}|x+2| - 3$



Square Root Function (Wave) $y = a\sqrt{x-h} + k$

Parent Function $f(x) = \sqrt{x}$

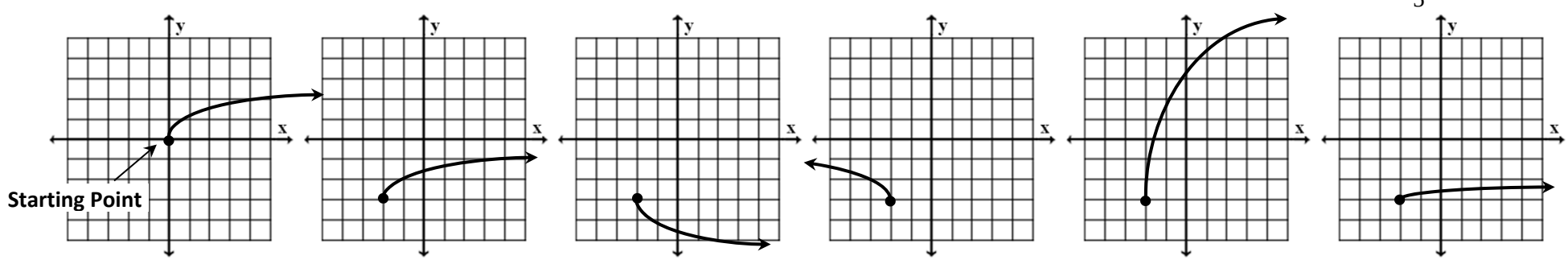
Shift $f(x) = \sqrt{x+2} - 3$

Shift and Horizontal Reflection $f(x) = -\sqrt{x+2} - 3$

Shift and Vertical Reflection $f(x) = \sqrt{-(x+2)} - 3$

Shift and Vertical Stretch $f(x) = 5\sqrt{(x+2)} - 3$

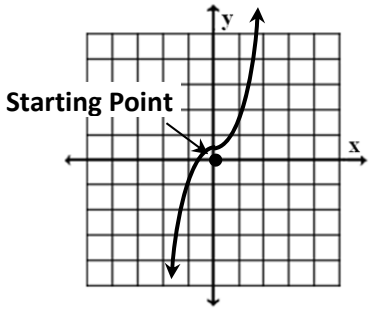
Shift and Vertical Shrink $f(x) = \frac{1}{5}\sqrt{(x+2)} - 3$



Cubic Function (S-Shaped) $y = a(x-h)^3 + k$

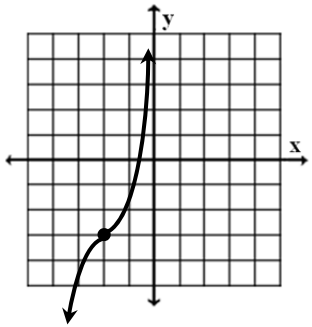
Parent Function

$$f(x) = x^3$$



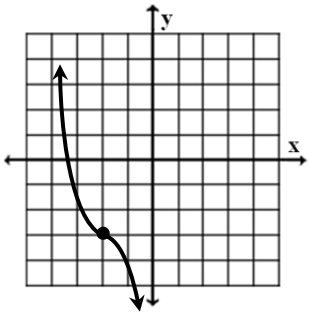
Shift

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



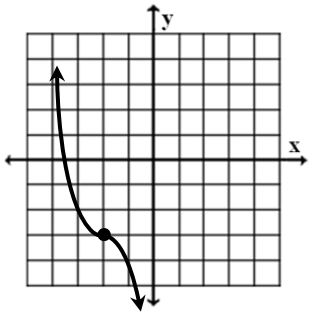
Shift and Horizontal Reflection

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



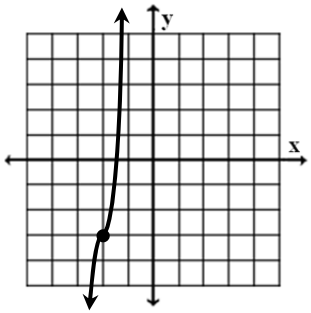
Shift and Vertical Reflection

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



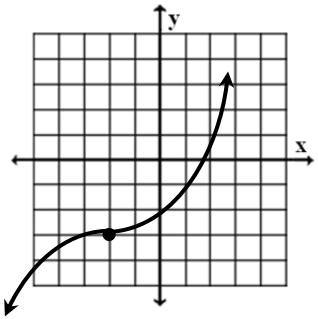
Shift and Vertical Stretch

$$f(x) = 5(x+2)^3 - 3$$



Shift and Vertical Shrink

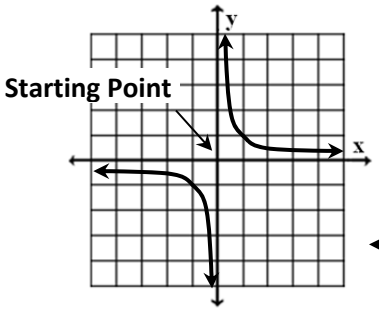
$$f(x) = \frac{1}{5}(x+2)^3 - 3$$



Reciprocal Function $y = a\left(\frac{1}{x-h}\right) + k$

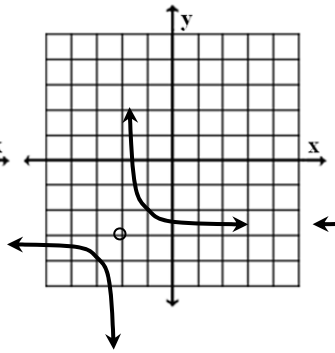
Parent Function

$$y = \frac{1}{x}$$



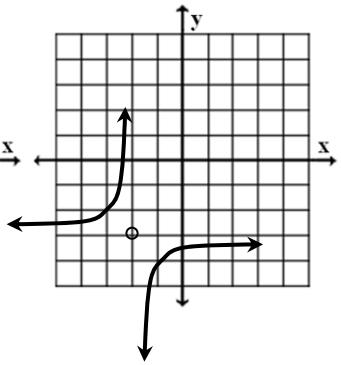
Shift

$$y = \frac{1}{x+2} - 3$$



Shift and Reflection

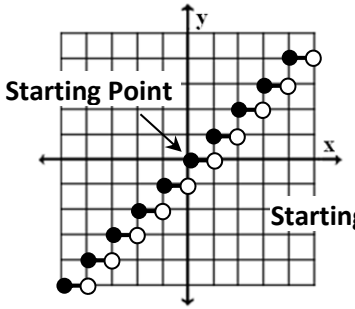
$$y = -\frac{1}{x+2} - 3$$



Greatest Integer Function (Steps) $y = a[\![x-h]\!] + k$

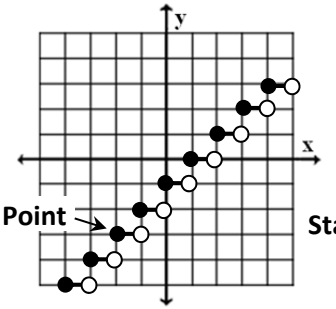
Parent Function

$$f(x) = [\![x]\!]$$



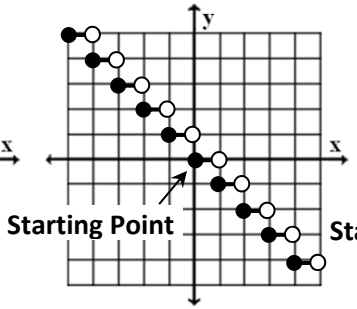
Shift

$$f(x) = [\![x+2]\!] - 3$$



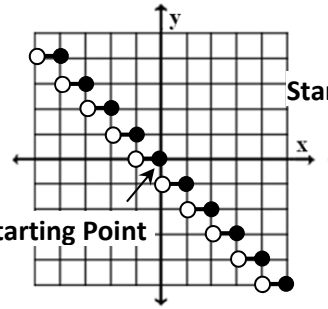
Shift and Horizontal Reflection

$$f(x) = -[\![x]\!]$$



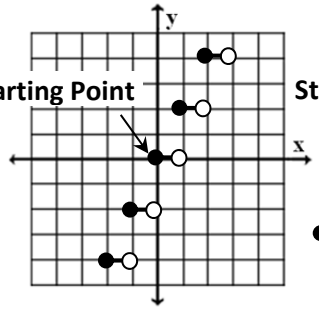
Shift and Vertical Reflection

$$f(x) = [\![-x]\!]$$



Shift and Vertical Stretch

$$f(x) = 2[\![x]\!]$$



Horizontal Stretch

$$f(x) = \left[\!\!\left[\frac{1}{2}x\right]\!\!\right]$$