Transformations of Parent Functions

(Translation)

Parent functions can be transformed to create other members in a family of graphs.

Translations	$g(x) = f(x) + k$ is the graph of $f(x)$ **translated vertically –**	k units **up** when $k > 0$.
		k units **down** when $k < 0$.
	$g(x) = f(x - h)$ is the graph of $f(x)$ **translated horizontally –**	h units **right** when $h > 0$.
		h units **left** when $h < 0$.

Transformations of Parent Functions

(Reflection)

Parent functions can be transformed to create other members in a family of graphs.

Reflections	$g(x) = -f(x)$ is the graph of $f(x)$ –	**reflected** over the ***x*-axis**.
	$g(x) = f(-x)$ is the graph of $f(x)$ –	**reflected** over the ***y*-axis**.

Transformations of Parent Functions (Dilations)

Parent functions can be transformed to create other members in a family of graphs.

Dilations	$g(x) = a \cdot f(x)$ is the graph of $f(x)$ –	**vertical dilation** (stretch) if $a > 1$. **STRETCHES AWAY from X-AXIS**
		vertical dilation (compression) if $0 < a < 1$. **COMPRESSES TOWARD the X-AXIS**
	$g(x) = f(ax)$ is the graph of $f(x)$ –	**horizontal dilation** (compression) if $a > 1$. **COMPRESSES TOWARD the Y-AXIS**
		horizontal dilation (stretch) if $0 < a < 1$. **STRETCHES AWAY FROM the Y-AXIS**

Linear Function

(Transformational Graphing)

Translation

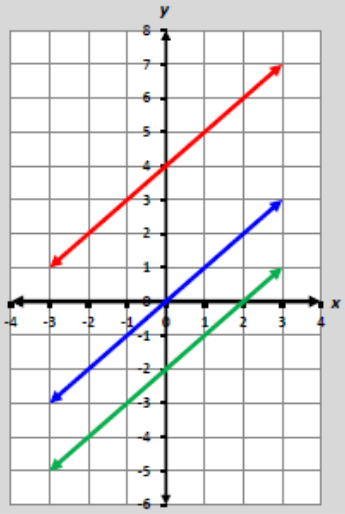
$g(x) = x + b$

Examples:

$f(x) = x$

$t(x) = x + 4$

$h(x) = x - 2$



Vertical translation of the parent function,

$f(x) = x$

Linear Function

(Transformational Graphing)

Vertical Dilation ($m>0$)

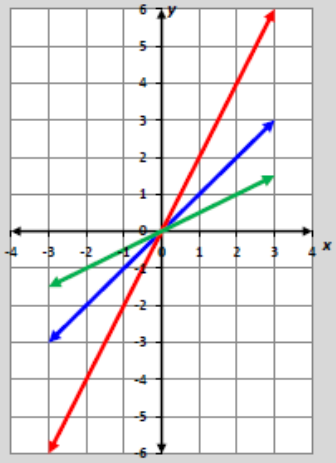
$g(x) = mx$

Examples:

$f(x) = x$

$t(x) = 2x$

$h(x) = \frac{1}{2}x$



Vertical dilation (stretch or compression) of the parent function, $f(x) = x$

Linear Function

(Transformational Graphing)

Vertical Dilation/Reflection ($m<0$)

$g(x) = mx$

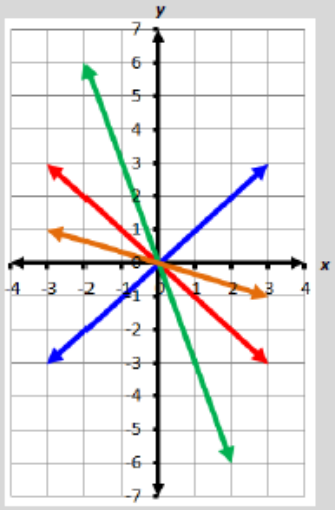
Examples:

$f(x) = x$

$t(x) = -x$

$h(x) = -3x$

$d(x) = -\frac{1}{3}x$



Vertical dilation (stretch or compression) with a reflection of $f(x) = x$

Quadratic Function

(Transformational Graphing)

Vertical Translation

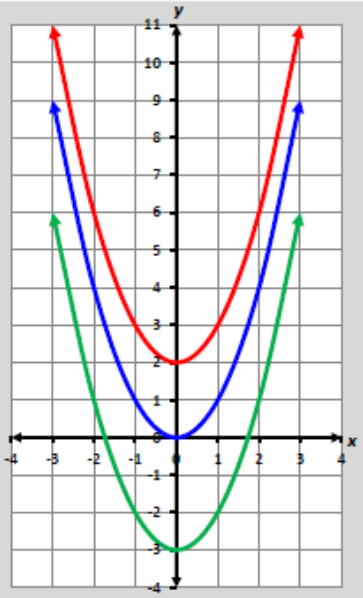
$h(x) = x^2 + c$

Examples:

$f(x) = x^2$

$g(x) = x^2 + 2$

$t(x) = x^2 - 3$



Vertical translation of $f(x) = x^2$

Quadratic Function

(Transformational Graphing)

Vertical Dilation ($a>0$)

$f(x) = x^2$

$g(x) = a \cdot f(x)$

Examples:

$f(x) = x^2$

$g(x) = 2 \cdot f(x)$

$g(x) = 2x^2$

$t(x) = \frac{1}{3} \cdot f(x)$

$t(x) = \frac{1}{3}x^2$

Vertical dilation (stretch or compression) of

$f(x) = x^2$

Quadratic Function

(Transformational Graphing)

Horizontal Dilation ($a>0$)

$f(x) = x^2$

$g(x) = f(b \cdot x)$

Examples:

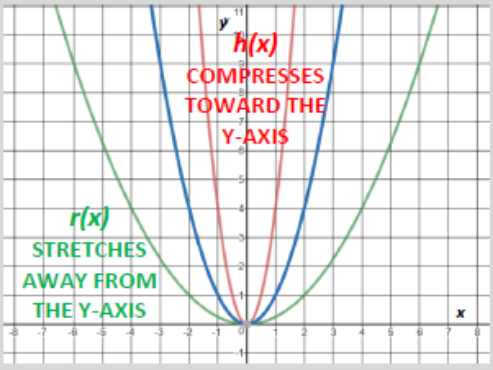
$f(x) = x^2$

$h(x) = f(2 \cdot x)$

$h(x) = (2x)^2 = 4x^2$

$r(x) = f\left(\frac{1}{2} \cdot x\right)$

$r(x) = \left(\frac{1}{2}x\right)^2 = \frac{1}{4}x^2$



Horizontal dilation (stretch or compression)
of $f(x) = x^2$

Quadratic Function

(Transformational Graphing)

Vertical Dilation/Reflection ($a<0$)

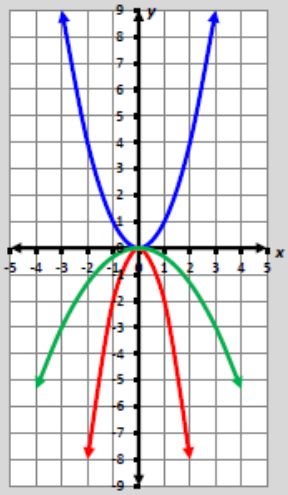
$h(x) = ax^2$

Examples:

$f(x) = x^2$

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

$t(x) = -\frac{1}{3}x^2$



Vertical dilation (stretch or compression) with a reflection of $f(x) = x^2$

Quadratic Function

(Transformational Graphing)

Horizontal Translation

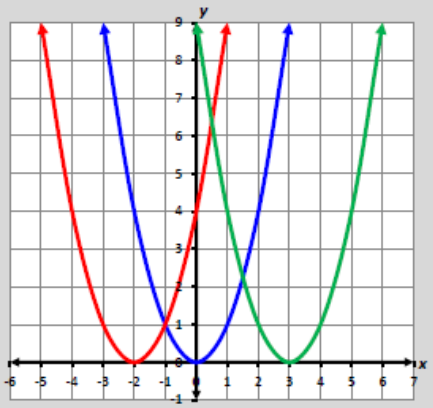
$h(x) = (x + c)^2$

Examples:

$f(x) = x^2$

$g(x) = (x + 2)^2$

$t(x) = (x - 3)^2$



Horizontal translation of $f(x) = x^2$