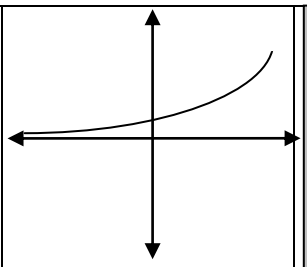
Pre-Calculus Parent Functions I

Translations on Exponential and Absolute Value Functions

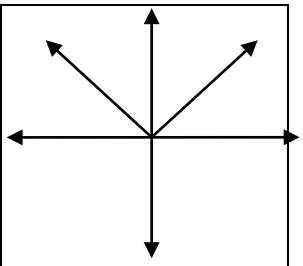
$y_1 = f(x) = 2^x$

x	y
–2	¼
–1	½
0	1
1	2
2	4



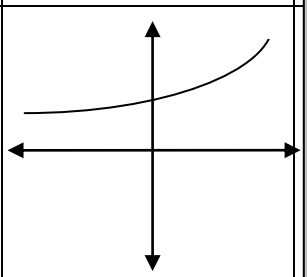
$y_1 = f(x) = |x|$

x	y
–2	2
–1	1
0	0
1	1
2	2



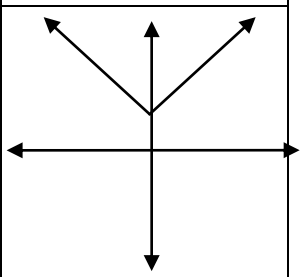
$y_2 = f(x) + 2 = 2 + 2^x$

x	y
–2	2¼
–1	2½
0	3
1	4
2	6



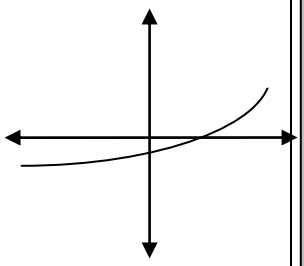
$y_2 = f(x) + 2 = |x| + 2$

x	y
–2	4
–1	3
0	2
1	3
2	4



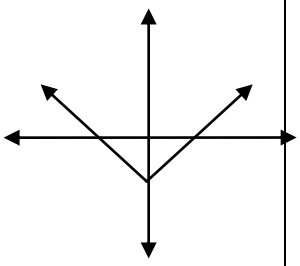
$y_3 = f(x) - 2 = {}^{-}2 + 2^x$

x	y
–2	–1.75
–1	–1.5
0	–1
1	0
2	2



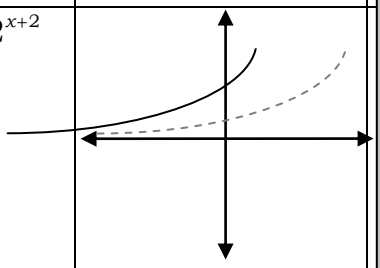
$y_3 = f(x) - 2 = |x| - 2$

x	y
–2	0
–1	–1
0	–2
1	–1
2	–2



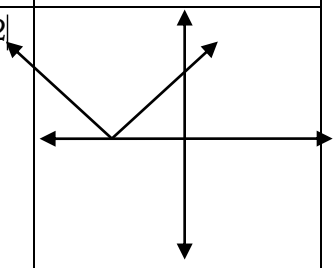
$y_4 = f(x + 2) = 2^{x+2}$

x	y
–4	¼
–3	½
–2	1
–1	2
0	4



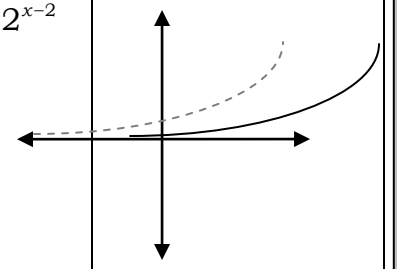
$y_4 = f(x + 2) = |x + 2|$

x	y
–4	2
–3	1
–2	0
–1	1
0	2



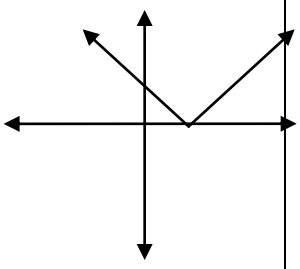
$y_5 = f(x - 2) = 2^{x-2}$

x	y
0	¼
1	½
2	1
3	2
4	4



$y_5 = f(x - 2) = |x - 2|$

x	y
0	2
1	1
2	0
3	1
4	2

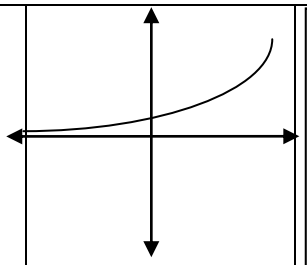


Pre-Calculus Parent Functions II

Reflections on Exponential and Square Root Functions

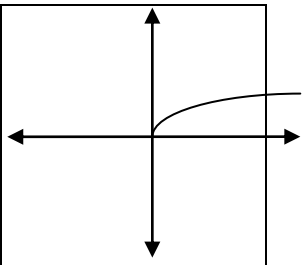
$y = f(x) = 2^x$

x	y
–2	¼
–1	½
0	1
1	2
2	4



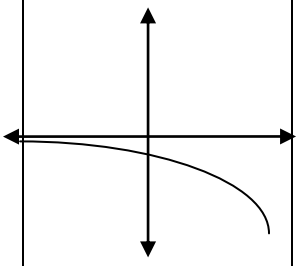
$y_1 = f(x) = \sqrt{x}$

x	y
0	0
¼	½
1	1
4	2
9	3



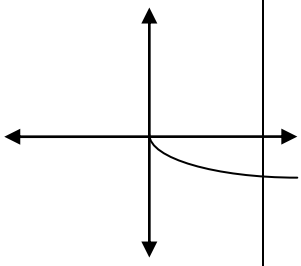
$y_6 = -f(x) = -2^x$

x	y
–2	–¼
–1	–½
0	–1
1	–2
2	–4



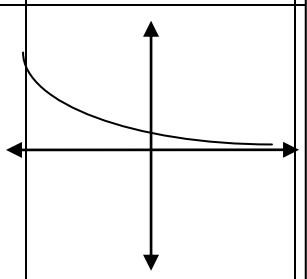
$y_2 = -f(x) = -\sqrt{x}$

x	y
0	0
¼	–½
1	–1
4	–2
9	–3



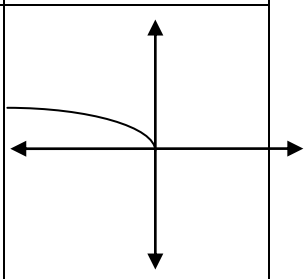
$y_7 = f(-x) = 2^{-x}$

x	y
–2	4
–1	2
0	1
1	½
2	¼



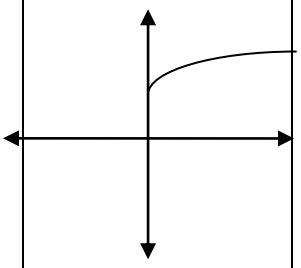
$y_3 = f(-x) = \sqrt{-x}$

x	y
0	0
–¼	½
–1	1
–4	2
–9	3



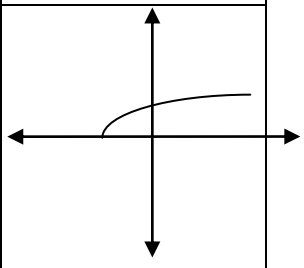
$y_4 = 2 + f(x) = 2 + \sqrt{x}$

x	y
0	2
¼	2½
1	3
4	4
9	5



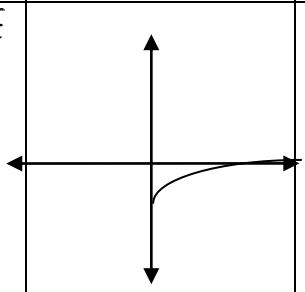
$y_5 = f(x+2) = \sqrt{x+2}$

x	y
–2	0
–1.75	½
–1	1
2	2
7	3



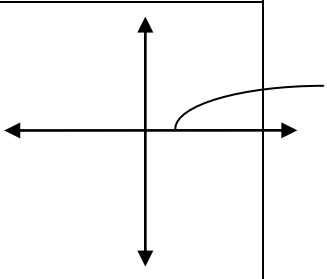
$y_6 = {}^-2 + f(x) = {}^-2 + \sqrt{x}$

x	y
0	–2
¼	–1.5
1	–1
4	0
9	1



$y_7 = f(x-2) = \sqrt{x-2}$

x	y
2	0
2¼	½
3	1
6	2
11	3

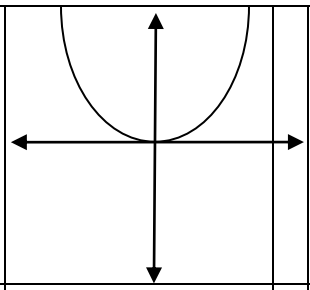


Pre-Calculus Parent Functions III

Translations Combined Parabola Vertices Revisited

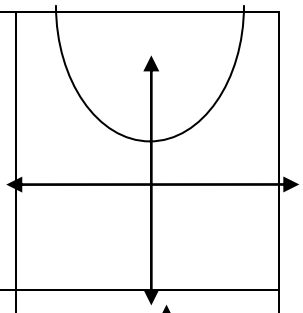
$y_1 = f(x) = x^2$

x	y
−2	4
−1	1
0	0
1	1
2	4



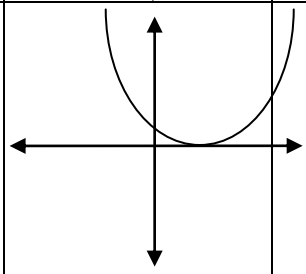
$y_3 = f(x) + 2 = x^2 + 2$

x	y
−2	6
−1	3
0	2
1	3
2	6



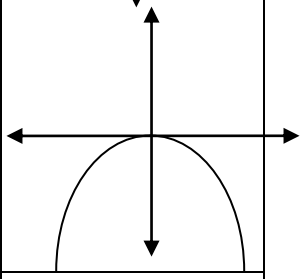
$y_2 = f(x-2) = |x-2|^2$

x	y
−2	2
−1	−1
0	−2
1	−1
2	2



$y_4 = -f(x) = -x^2$

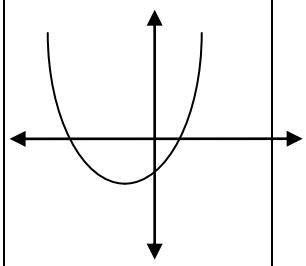
x	y
−2	−4
−1	−1
0	−0
1	−1
2	−4



$y_5 = f(x+1) - 2$

$= |x+1|^2 - 2$

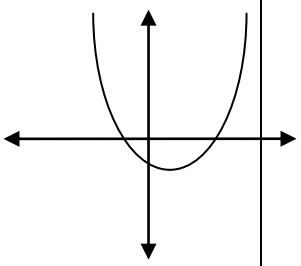
x	y
−3	2
−2	−1
−1	−2
0	−1
1	2



$y_6 = f(x-1) - 2$

$= |x-1|^2 - 2$

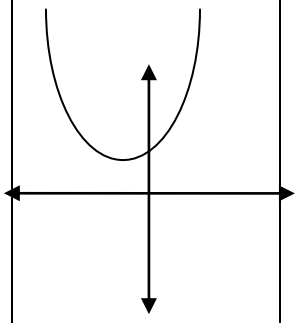
x	y
−1	2
0	−1
1	−2
2	−1
3	2



$y_7 = f(x+1) + 2$

$= |x+1|^2 + 2$

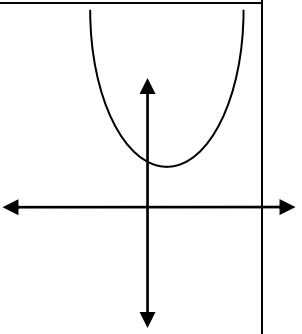
x	y
−3	6
−2	3
−1	2
0	3
1	6



$y_8 = f(x-1) + 2$

$= |x-1|^2 + 2$

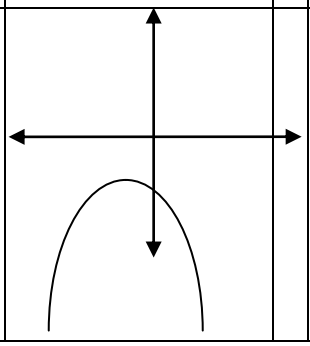
x	y
−1	6
0	3
1	2
2	3
3	6



$y_9 = -f(x+1) - 2$

$= -|x+1|^2 - 2$

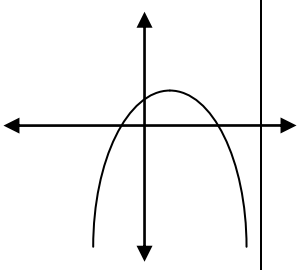
x	y
−3	−6
−2	−3
−1	−2
0	−3
1	−6



$y_0 = -f(x-1) + 2$

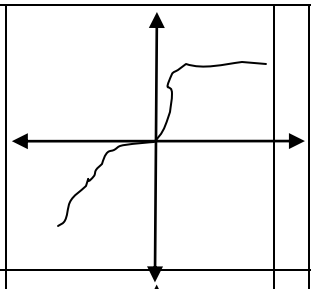
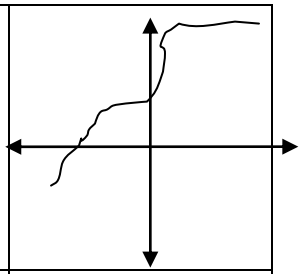
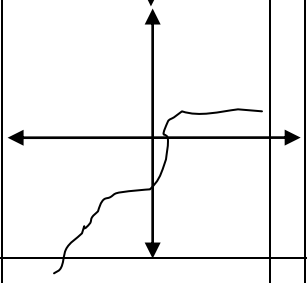
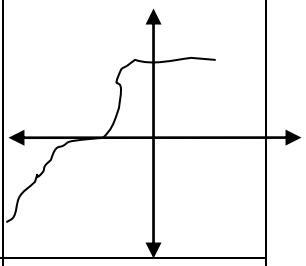
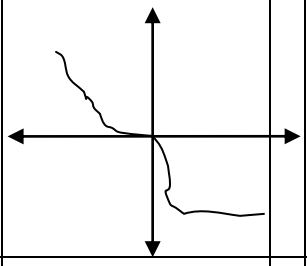
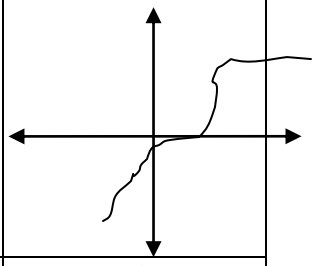
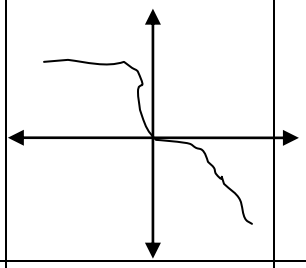
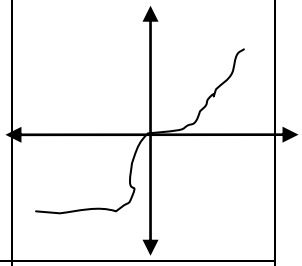
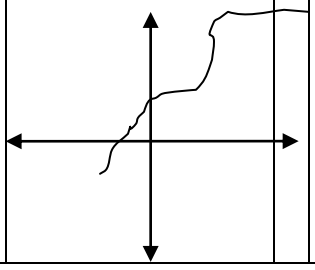
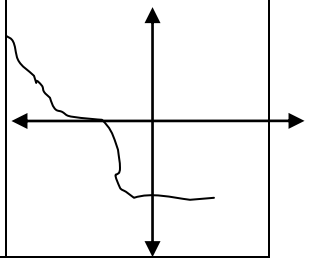
$= -|x-1|^2 + 2$

x	y
−1	−2
0	1
1	2
2	1
3	−2



Pre-Calculus Parent Functions IV

Translations Abstracted

$y_1 = f(x)$		$y_2 = f(x) + 2$	
$y_3 = f(x) - 2$		$y_4 = f(x + 2)$	
$y_5 = -f(x)$		$y_6 = f(x - 2)$	
$y_7 = f(-x)$		$y_8 = -f(-x)$	
$y_9 = f(x - 2) + 2$		$y_0 = -f(x + 2)$	

Transformations are officially *translation* ("slide"), *reflection* ("flip"), and *rotation* ("spin").

Graphs of the trigonometric functions (sine, cosine, tangent) will help introduce a fourth, *shear* (shrink/magnify).