Compressions and Stretches and More on Translations of Functions

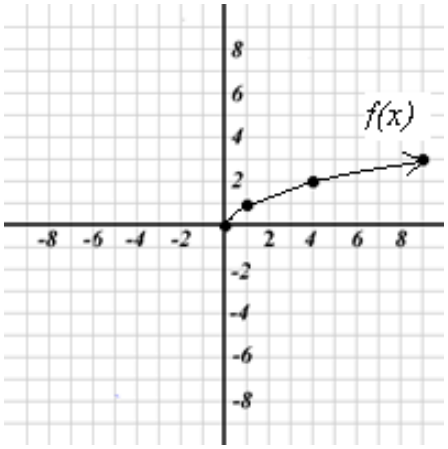
The concept of symmetry is critical to the understanding of how to translate or reflect curves. The following examples show some basic curve functions, first in their standard position and then transformed in several ways. By noting the similarities that each alteration brings to the standard position graph, one may be able to predict the changes that they will bring to other functions. You should also be aware that these changes may be combined to bring even more unique changes.

Example 1: $f(x) = \sqrt{x}$

Solution:

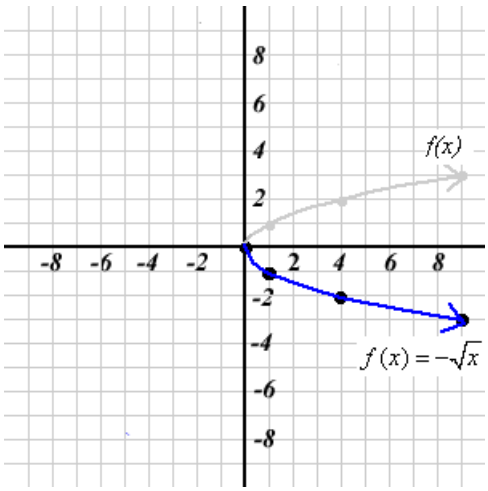
a.) Standard position. $f(x) = \sqrt{x}$

x	f(x)
0	0
1	1
4	2



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

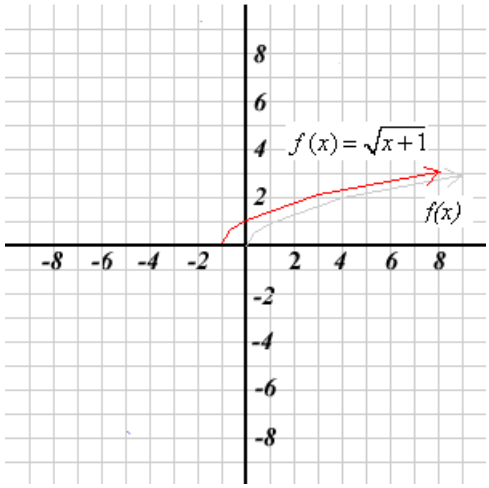
x	f(x)
0	0
1	-1
4	-2



Example 1 (Continued):

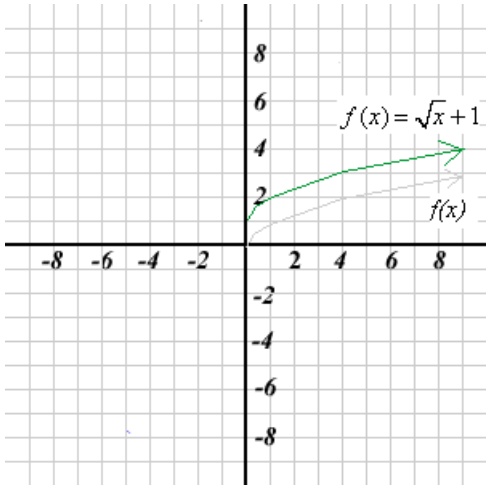
c.) **Addition with in radical.** $f(x) = \sqrt{x+1}$

x	f(x)
-1	0
0	1
3	2



d.) **Addition outside radical.** $f(x) = \sqrt{x} + 1$

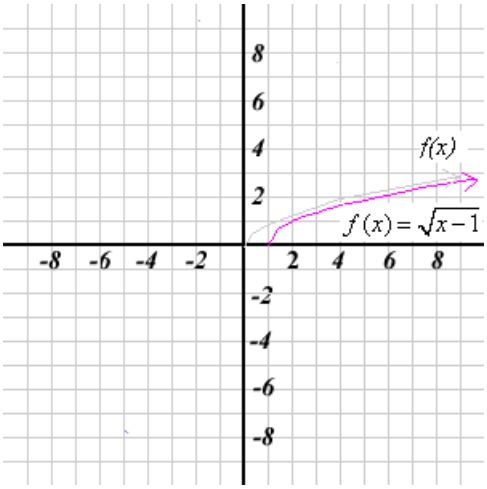
x	f(x)
0	1
1	2
4	3



Example 1 (Continued):

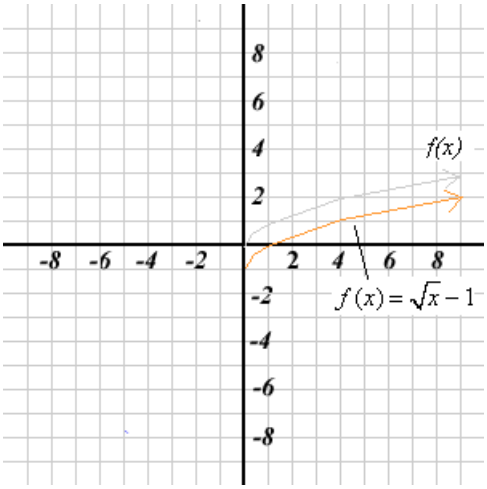
e.) **Subtraction within radical.** $f(x) = \sqrt{x-1}$

x	f(x)
1	0
2	1
5	2



f.) **Subtraction outside radical.** $f(x) = \sqrt{x} - 1$

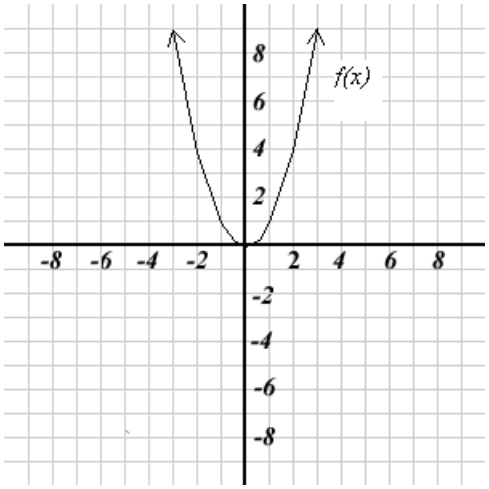
x	f(x)
0	-1
1	0
4	1



Example 2: $f(x) = x^2$

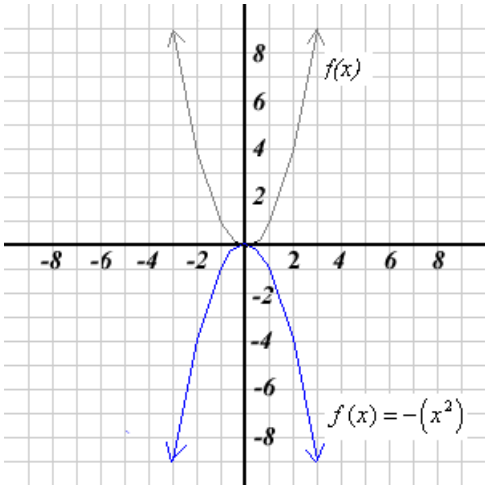
a.) Standard position. $f(x) = x^2$

x	f(x)
0	0
±1	1
±2	4



b.) Negation. $f(x) = -(x^2)$

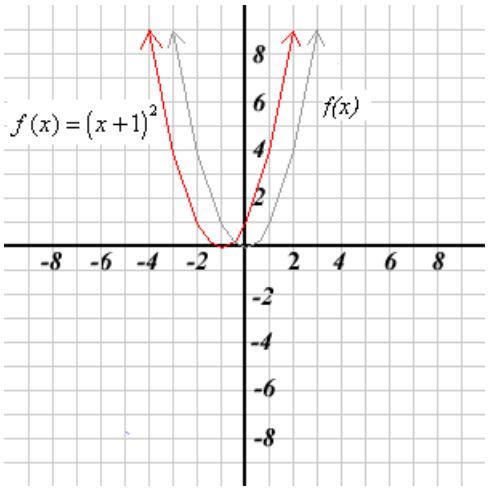
x	f(x)
0	0
±1	-1
±2	-4



Example 2 (Continued):

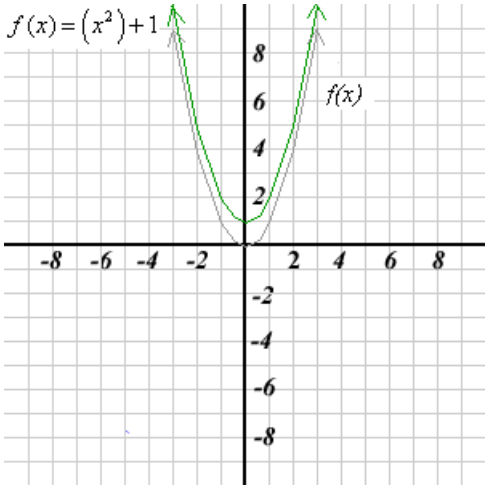
c.) **Addition within parenthesis.** $f(x) = (x + 1)^2$

x	f(x)
-3	4
-2	1
-1	0
0	1
1	4



d.) **Addition outside parenthesis.** $f(x) = (x^2) + 1$

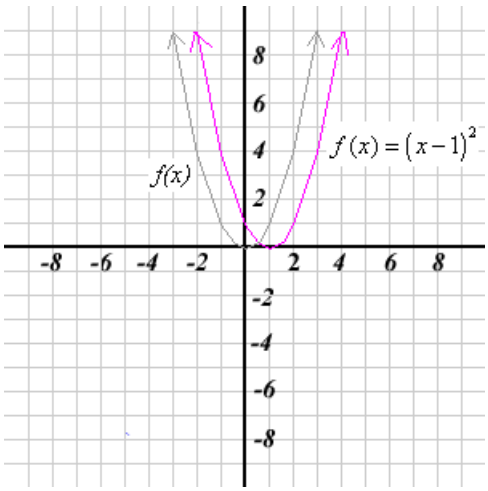
x	f(x)
0	1
±1	2
±2	5



Example 2 (Continued):

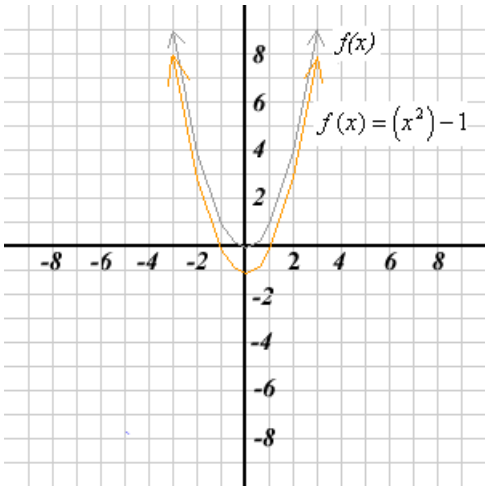
e.) **Subtraction within parenthesis.** $f(x) = (x-1)^2$

x	f(x)
-1	4
0	1
1	0
2	1
3	4



f.) **Subtraction outside parenthesis.** $f(x) = x^2 - 1$

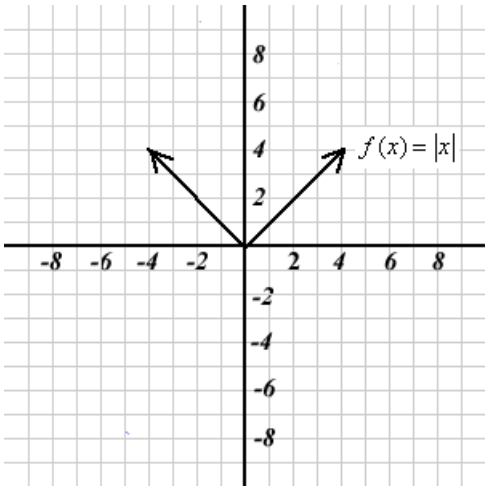
x	f(x)
0	-1
±1	0
±2	3



Example 3: $f(x) = |x|$

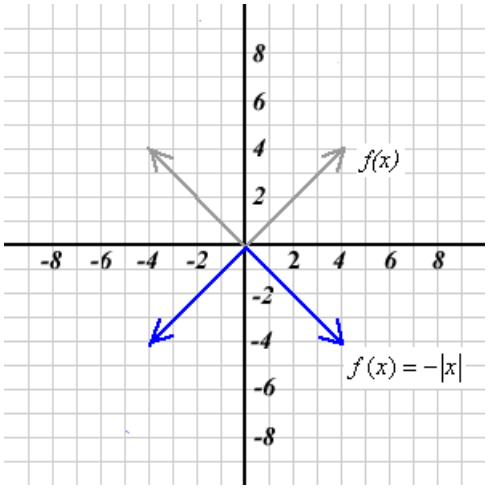
a.) Standard position. $f(x) = |x|$

x	f(x)
0	0
±1	1
±2	2
±3	3



b.) Negation. $f(x) = -|x|$

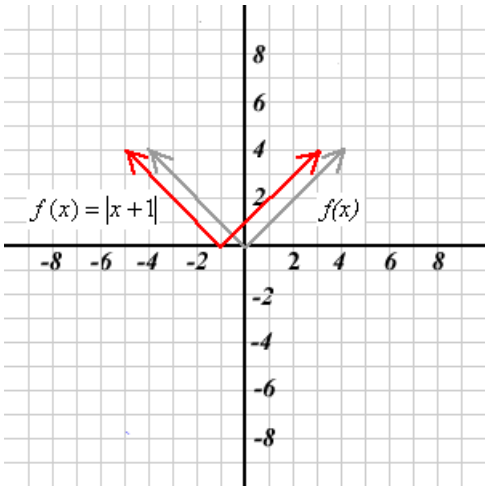
x	f(x)
0	0
±1	-1
±2	-2
±3	-3



Example 3 (Continued):

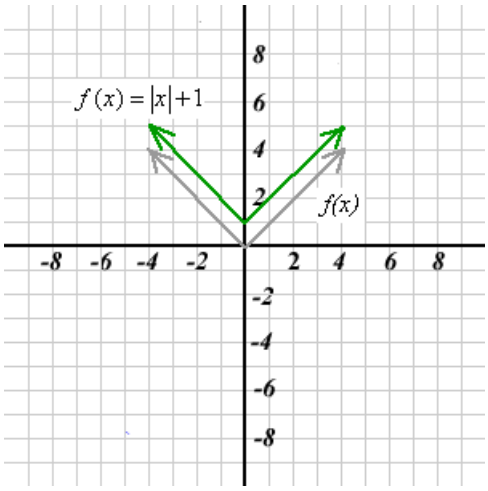
c.) **Addition within.** $f(x) = |x + 1|$

x	f(x)
-4	3
-3	2
-2	1
-1	0
0	1
1	2
2	3



d.) **Addition outside.** $f(x) = |x| + 1$

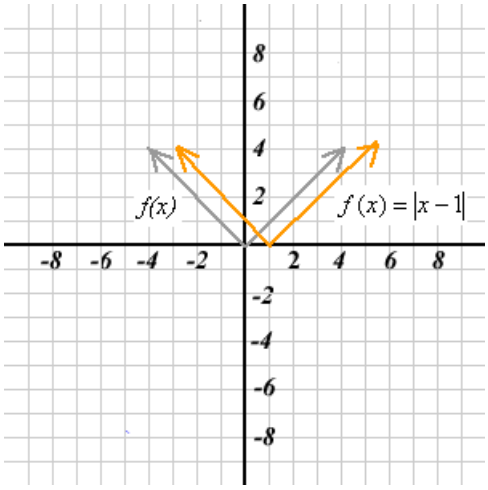
x	f(x)
0	1
±1	2
±2	3
±3	4



Example 3 (Continued):

e.) **Subtraction within.** $f(x) = |x - 1|$

x	f(x)
-2	3
-1	2
0	1
1	0
2	1
3	2
4	3



f.) **Subtraction outside.** $f(x) = |x| - 1$

x	f(x)
0	-1
±1	0
±2	1
±3	2
±4	3