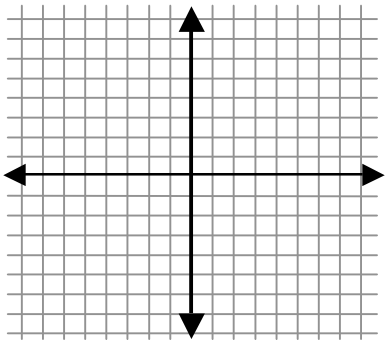
Transformations: Shifts, Reflections, and Stretches

Warm-up

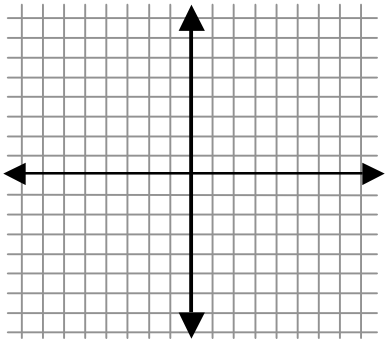
1. Fill in the table below and plot the points to graph the function.

$y = \lvert x \rvert$					
x	-2	-1	0	1	2
y					



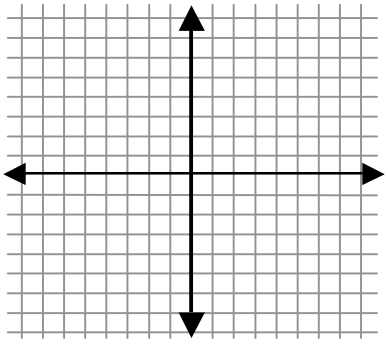
2. Fill in the table below and plot points to graph the function.

$y = \lvert x \rvert + 2$					
x	-2	-1	0	1	2
y					



3. Fill in the table below and plot points to graph the function.

$y = \lvert x - 3 \rvert$					
x	-2	-1	0	1	2
y					



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Vertical and Horizontal Shifts

Let c be a positive real number:

1. $h(x) = f(x) + c$ _____

2. $h(x) = f(x) - c$ _____

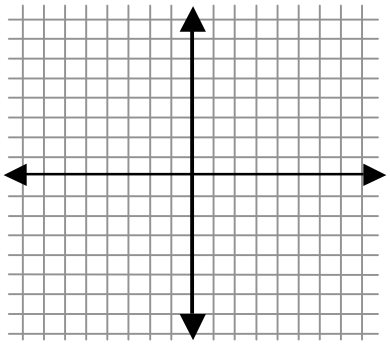
3. $h(x) = f(x + c)$ _____

4. $h(x) = f(x - c)$ _____

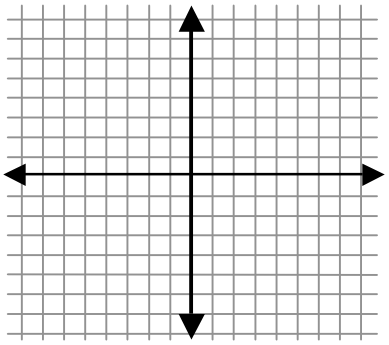
Example 1

a) Graph the parent function $f(x) = x^3$ by using the table below:

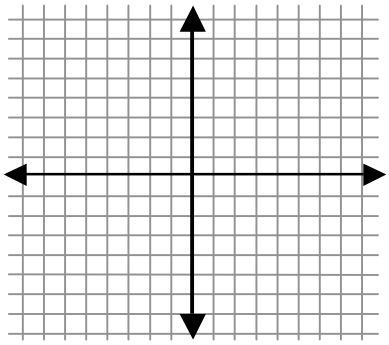
$f(x) = x^3$					
x	-2	-1	0	1	2
y					



b) Graph by shifting: $h(x) = x^3 - 1$



c) Graph by shifting: $g(x) = (x - 1)^3$



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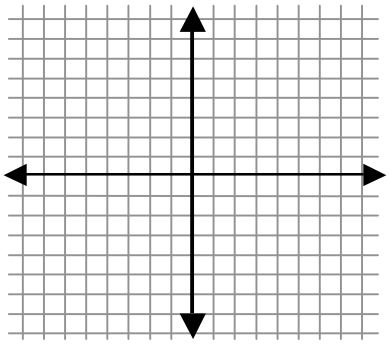
Practice Problem 1

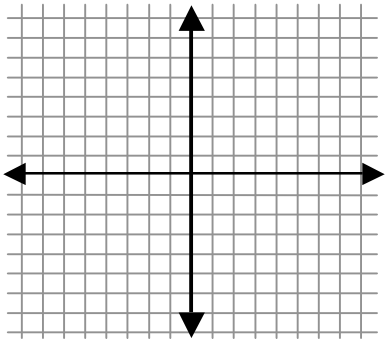
Graph $k(x) = (x+2)^2 + 1$ by shifting the parent graph $f(x) = x^3$



Example 2

a) Graph the parent function $f(x) = x^2$ using the table below.

$f(x) = x^2$					
x	-2	-1	0	1	2
y					



b) Describe the shift of $h(x) = x^2 + 4$

c) Describe the shift of $k(x) = (x+2)^2 - 1$

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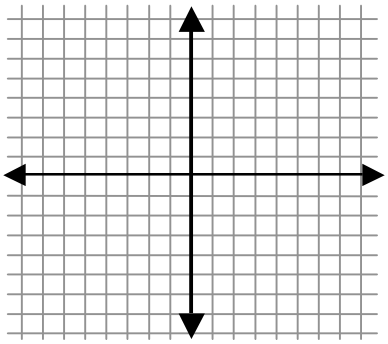
Reflecting Graphs

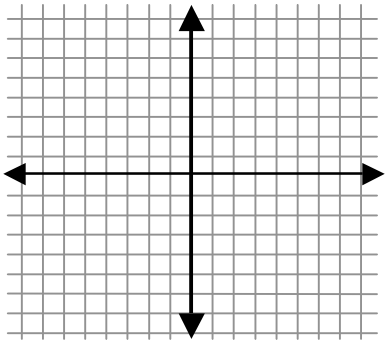
Graph the parent function of $f(x) = \sqrt{x}$ using the given table:

$f(x) = \sqrt{x}$				
x	0	1	4	9
y				



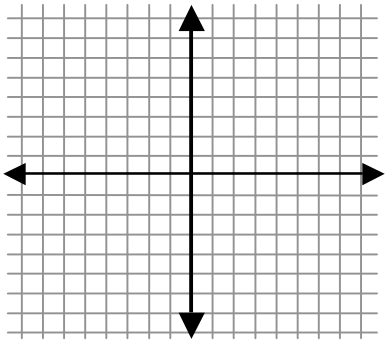
Graph the function $g(x) = -\sqrt{x}$ using the table below:

$f(x) = -\sqrt{x}$				
x	0	1	4	9
y				



Graph the function of $f(x) = \sqrt{-x}$ using the given table:

$f(x) = \sqrt{x}$				
x	0	-1	-4	-9
y				



Summary of Reflections:

1. $h(x) = -f(x)$ _____

2. $h(x) = f(-x)$ _____

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Example 3

a) Describe the transformation of $f(x) = x^2$: $g(x) = -x^2 + 2$

b) Describe the transformation of $f(x) = x^2$: $h(x) = -(x-3)^2$

Practice Problem 3

Consider the parent function $f(x) = \sqrt{x}$ and describe the following transformations:

a) $g(x) = -\sqrt{x} - 5$

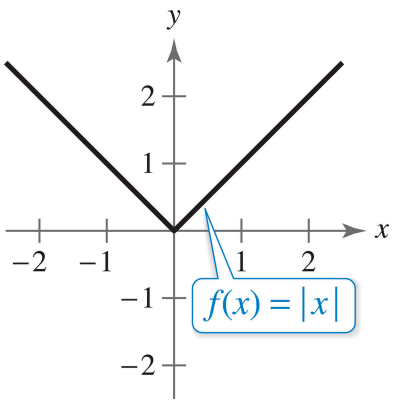
b) $h(x) = \sqrt{-x} + 2$

c) $k(x) = -\sqrt{x+2}$

Nonrigid Transformations

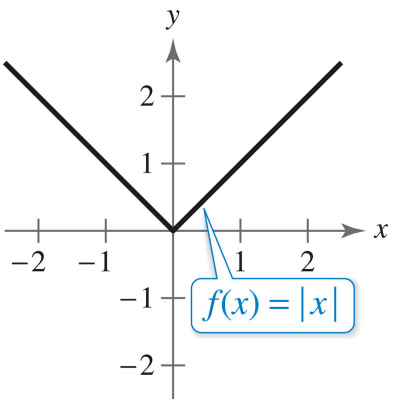
Given the parent graph $f(x) = |x|$, graph the transformations (on the same axes) using the tables below.

a) $g(x) = 3|x|$



$g(x) = 3\|x\|$					
x	-2	-1	0	1	2
y					

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



$g(x) = \frac{1}{2}\|x\|$					
x	-2	-1	0	1	2