

PARENT FUNCTIONS AND TRANSFORMATIONS

Parent Functions

One of the things we do in calculus is study the behavior of functions. Some of the most basic functions you should be able to recognize and graph without the use of a calculator. You should be able to sketch a fairly accurate graph of the following parent functions:

$$y = x$$

$$y = x^2$$

$$y = x^3$$

$$y = \sqrt{x}$$

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

$$y = \frac{1}{x^2}$$

$$y = |x|$$

$$y = [x]$$

$$y = ab^x, 0 < b < 1$$

$$y = ab^x, 1 < b$$

$$y = \log x$$

$$y = \sin x$$

$$y = \cos x$$

$$y = \tan x$$

Transformations

Not only should you be able to graph the parent functions above, but you should be able to graph the transformations of these graphs.

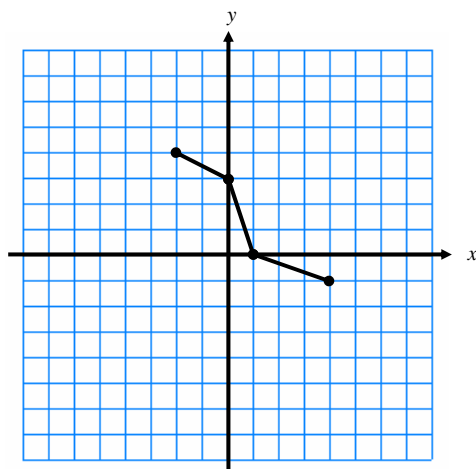
Example: Suppose you are given the function $f(x)$. What effect do a , b , c , and d have on original function if your new function is $a \cdot f(b(x+c)) + d$

Another way to look at this is with the following chart:

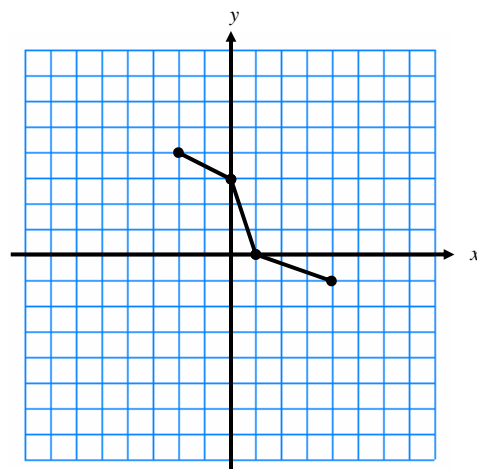
	Inside		Outside	
+/-	$f(x+c)$	$f(x-c)$	$f(x)+d$	$f(x)-d$
\times/\div	$f(bx)$	$f(-x)$	$a \cdot f(x)$	$-f(x)$

Example: Let f be the graph given in the picture below. Graph the following transformations of f .

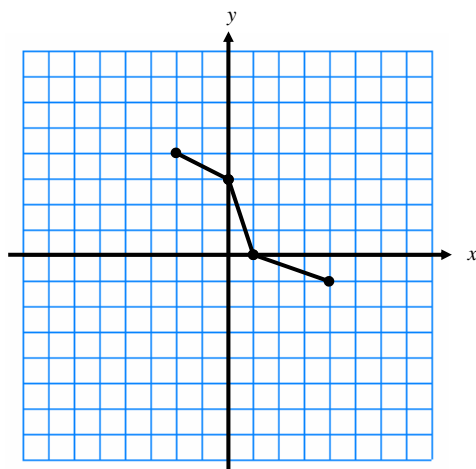
- a) $f(x)+2$
- b) $-f(x)$
- c) $f(x-2)$
- d) $f(x+3)$



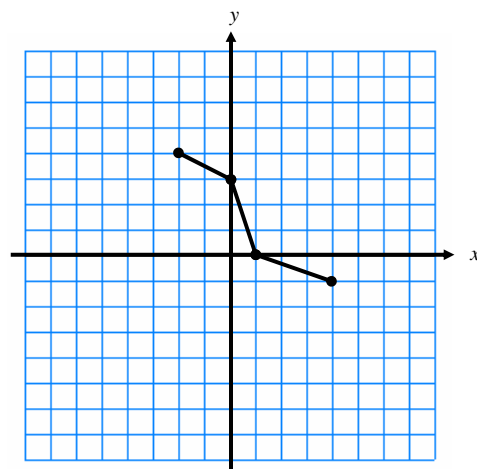
- e) $2f(x)$
- f) $f(-x)$



- g) $f(\frac{1}{2}x)$
- h) $f(2x-6)$

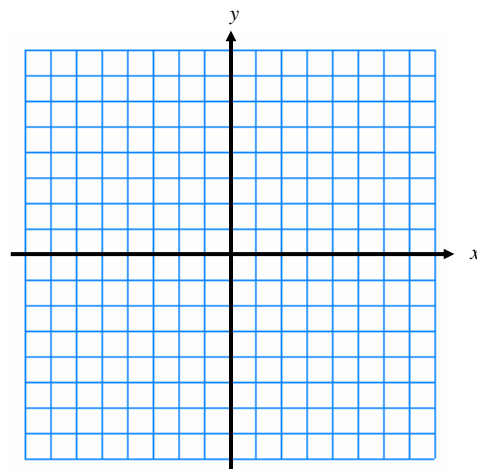
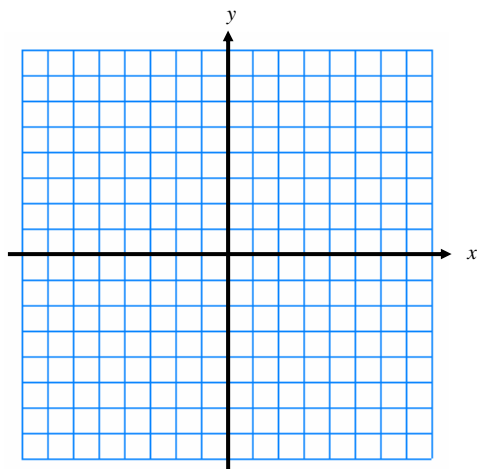


- i) $f(|x|)$
- j) $|f(x)|$



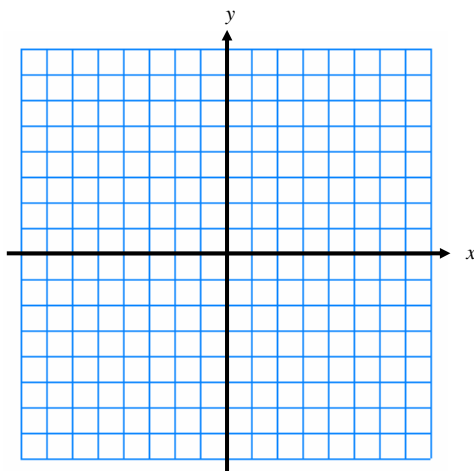
Example: First graph $f(x) = \log_2 x$. Then graph the following transformations:

- a) $y = 4 - f(x)$
- b) $y = -f(x-1)$
- c) $y = \frac{1}{4}f(x+2)$
- d) $y = -2f(x-1)+3$

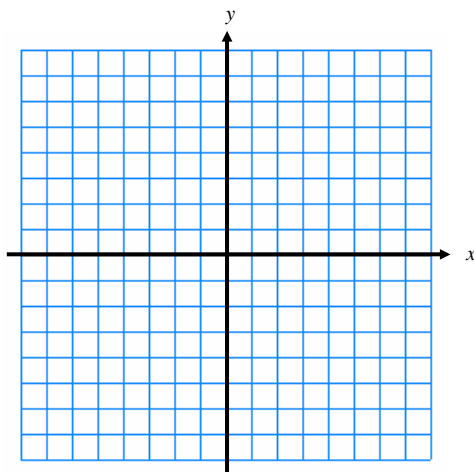


Example: For $a - c$, graph $f(x) = \sqrt{x}$ first, and then graph each transformation.

a) $y = \sqrt{x} + 2$



b) $y = -\sqrt{2x-3}$



c) $y = 2\sqrt{x+2}$

