

# Shifting, Stretching and Reflecting Graphs

## Transformations

$f(x)+c$  add  $c$  to each  $y$  value

$f(x)-c$  subtract  $c$  from each  $y$  value

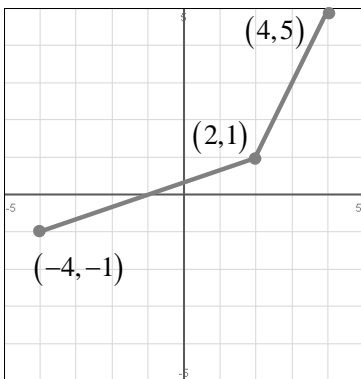
$f(x+c)$  subtract  $c$  from each  $x$  value

$f(x-c)$  add  $c$  to each  $x$  value

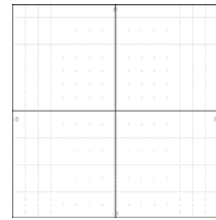
$c \cdot f(x)$  multiply  $c$  by each  $y$  value

$f(c \cdot x)$  divide each  $x$  value by  $c$

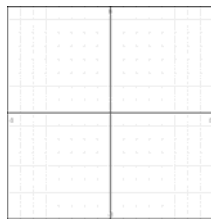
1. Use the graph to sketch each transformation.



a)  $f(x)+3$



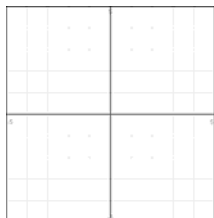
b)  $f(x+2)$



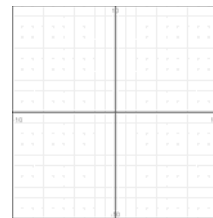
c)  $f(x)-1$



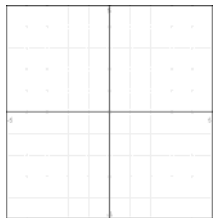
d)  $f(x-2)$



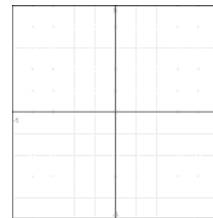
e)  $2f(x)$



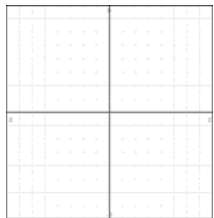
f)  $-f(x)$



g)  $f(-x)$



h)  $f\left(\frac{1}{2}x\right)$

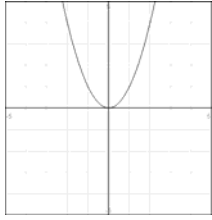


i)  $f(2x)$

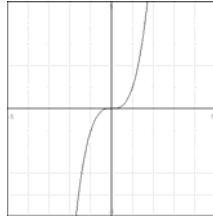


Parent Graphs

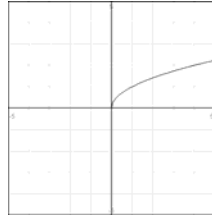
$$y = x^2$$



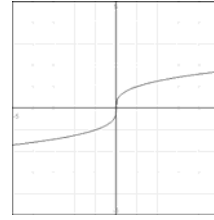
$$y = x^3$$



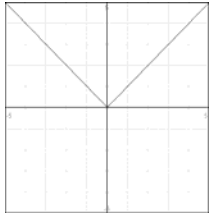
$$y = \sqrt{x}$$



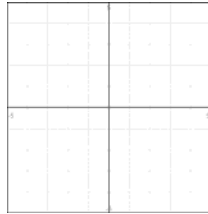
$$y = \sqrt[3]{x}$$



$$y = |x|$$



$$y = \lceil x \rceil$$



## Transformations

$f(x)+c$  shift graph up  $c$  units

$f(x)-c$  shift graph down  $c$  units

$f(x+c)$  shift graph left  $c$  units

$f(x-c)$  shift graph right  $c$  units

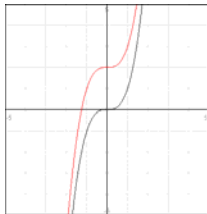
$-f(x)$  reflect graph over  $x$ -axis

$f(-x)$  reflect graph over  $y$ -axis

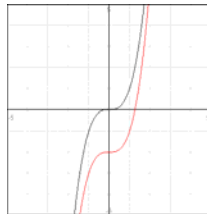
$f(c \cdot x)$  horizontal stretch if  $0 < c < 1$ , horizontal shrink if  $c > 1$

$c \cdot f(x)$  vertical shrink if  $0 < c < 1$ , vertical stretch if  $c > 1$

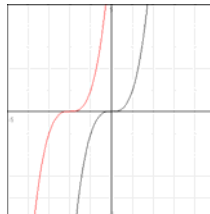
$$y = x^3$$
$$y = x^3 + 2$$



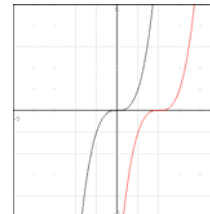
$$y = x^3$$
$$y = x^3 - 2$$



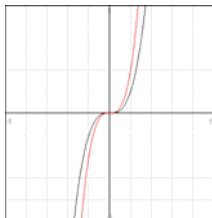
$$y = x^3$$
$$y = (x+2)^3$$



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



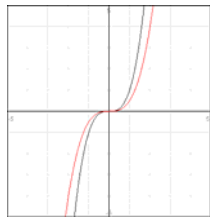
$$y = x^3$$
$$y = 2x^3$$



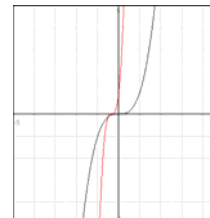
$$y = x^3$$
$$y = -x^3$$



$$y = x^3$$
$$y = \frac{1}{2}x^3$$

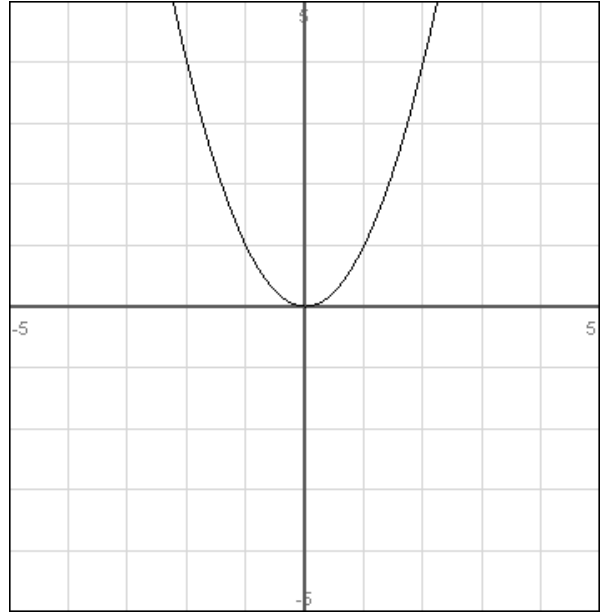


$$y = x^3$$
$$y = (3x+1)^3$$

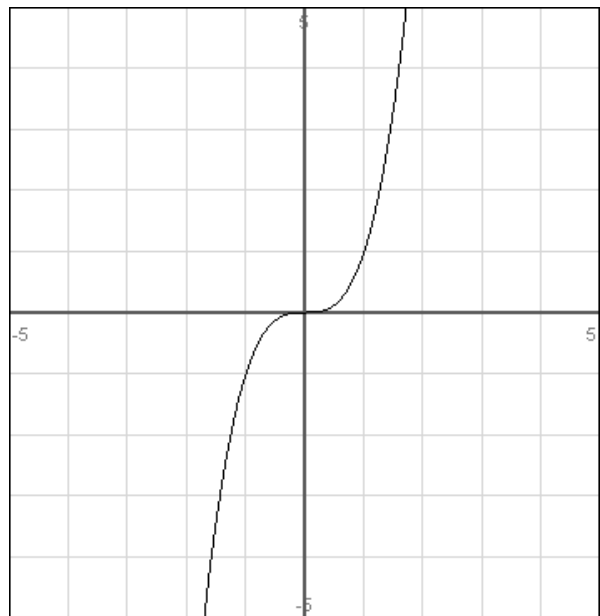


2. Describe the transformation from the parent function and then sketch the graph.

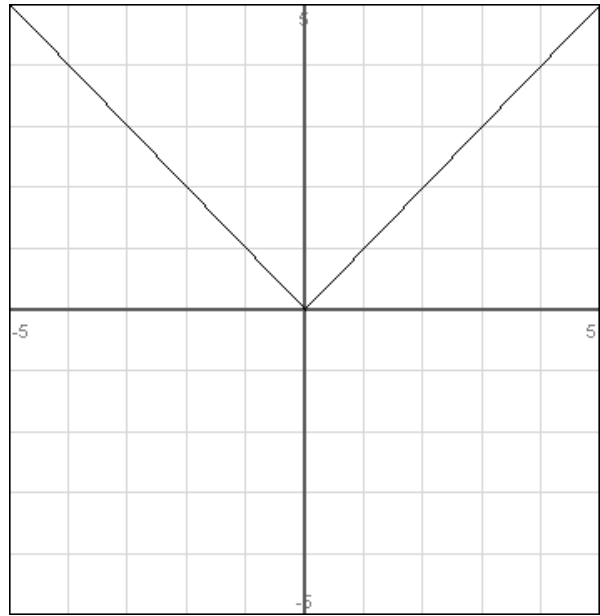
a)  $f(x) = (x-2)^2$



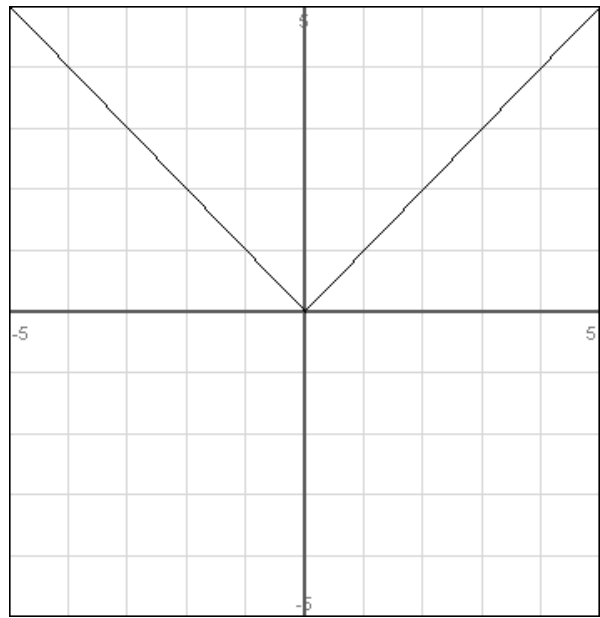
b)  $f(x) = -x^3 - 2$



c)  $f(x) = 3 - |x+1|$



d)  $f(x) = |-x+2|-1$



e)  $f(x) = 2 \llbracket x+3 \rrbracket$

