



# Graph Transformations (higher)

Key info:

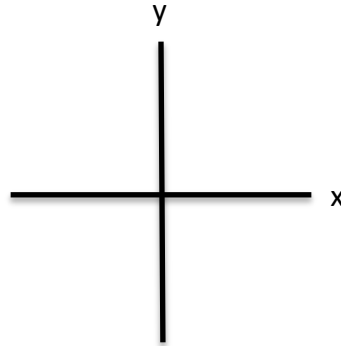
$f(x)$  = function of graph also written as  $y$  (the line or curve)

$f(x) + 2$  = shift graph up 2

$f(x) - 2$  = shift graph down 2

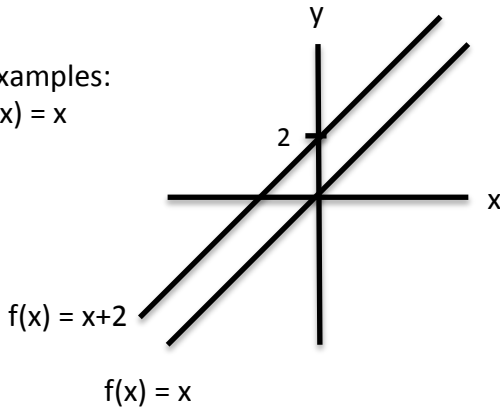
$f(x+2)$  = shift graph left 2

$f(x-2)$  = shift graph right 2



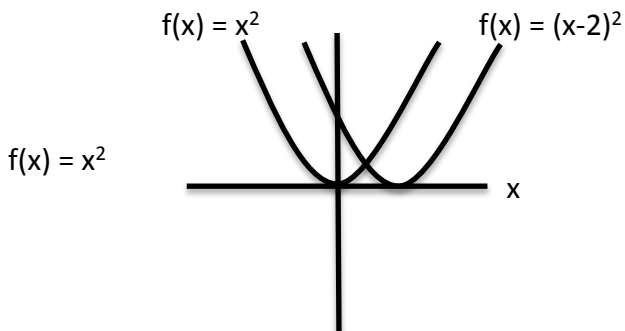
Examples:

$f(x) = x$



Here we have line  $y = x$  being transformed to  $y = x + 2$ . With straight lines, changes affect both the  $x$  and  $y$  coordinate.

We can say this graph either shifts up 2 (positive  $y$  direction) or shifts left 2 (negative  $x$  direction)



Here we have the line  $y = x^2$  being transformed to  $y = (x - 2)^2$

We describe this transformation as a shift in the positive  $x$  direction of 2.

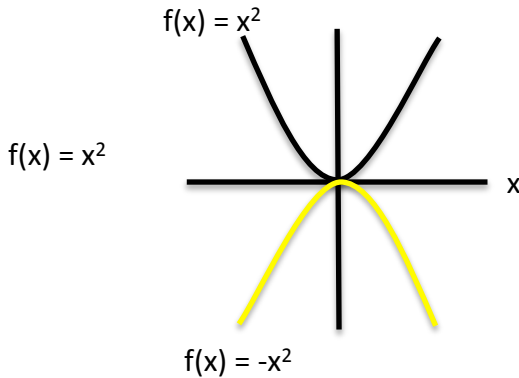


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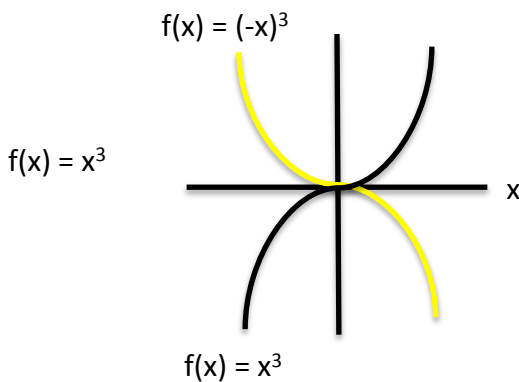
$-f(x)$  = reflection in x axis

$f(-x)$  = reflection in y axis



Here we have the line  $y = x^2$   
being transformed to  $y = -(x)^2$   
Please note:  $-x^2 \neq (-x)^2$   
Due to BIDMAS/BODMAS

This is a reflection in the x axis



Here we have the line  $y = x^3$   
being transformed to  $y = (-x)^3$

This is a reflection in the y axis

This is also a reflection in the x  
axis as well because  
 $-(-x)^3 = (-x)^3$

Useful pointers:

•  $y = f(x) + a$  translation by vector  $\begin{pmatrix} 0 \\ a \end{pmatrix}$

•  $y = f(x + a)$  translate by vector  $\begin{pmatrix} -a \\ 0 \end{pmatrix}$