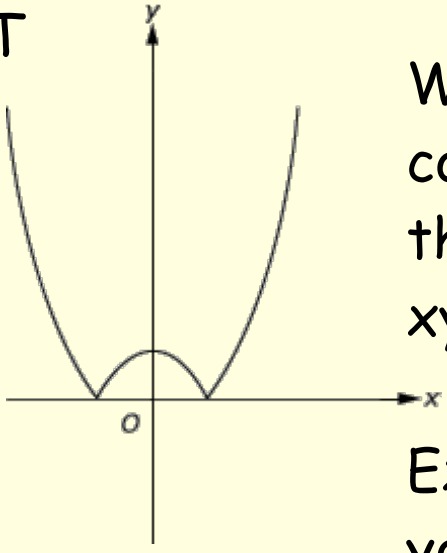
SAT

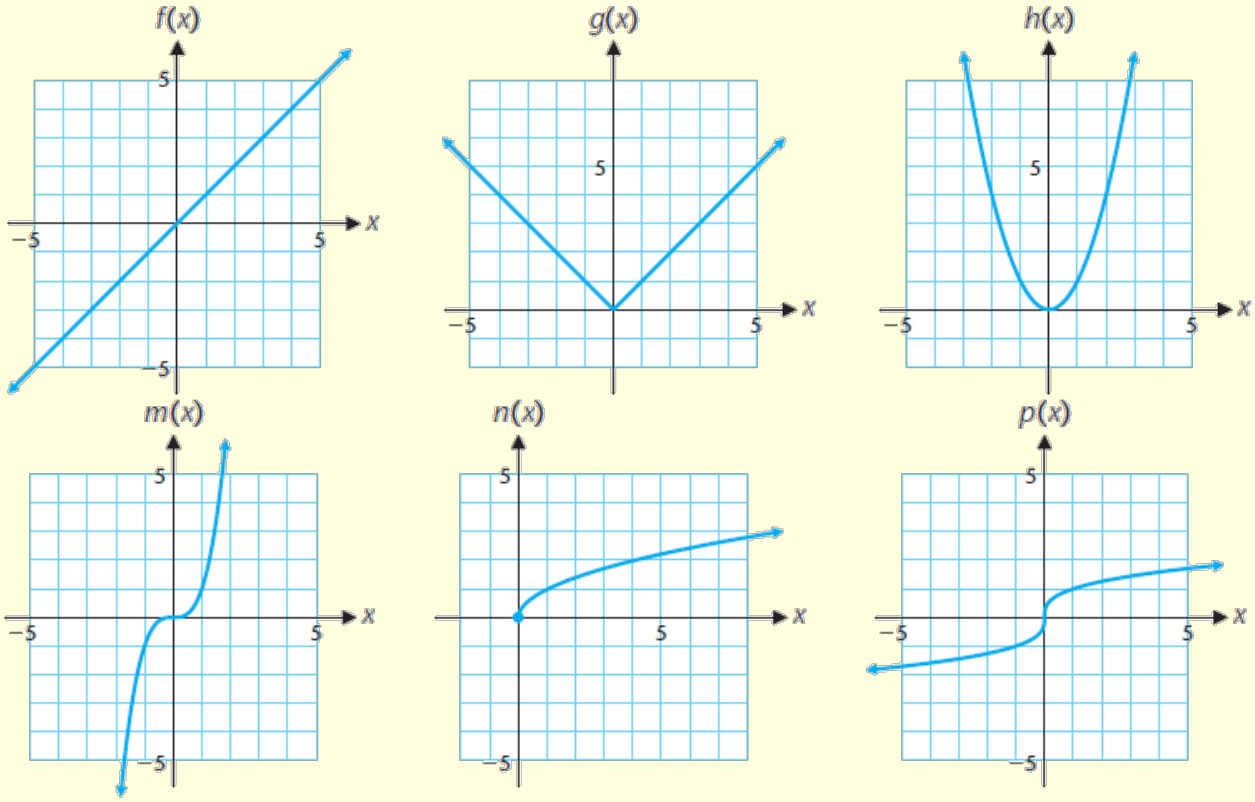


Which of the following could be the equation of the function graphed in the xy-plane on the left?

Explain the reasons for your choice.

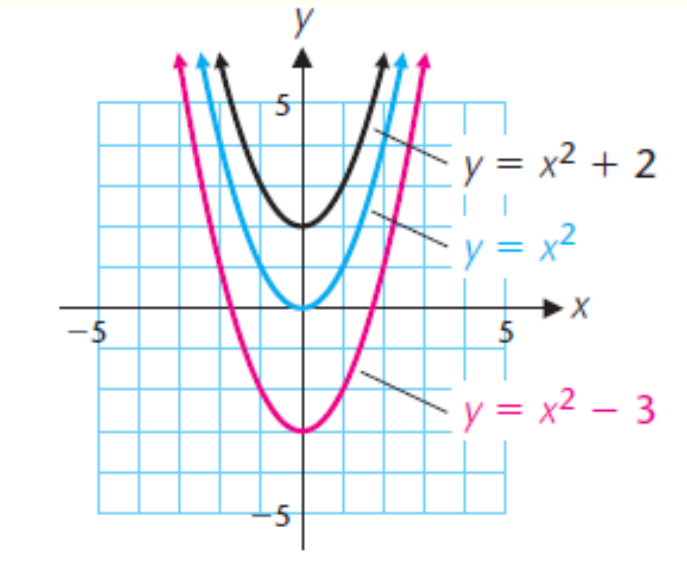
A. $y = (-x)^2 + 1$
B. $y = -x^2 + 1$
C. $y = |x^2 + 1|$
D. $y = |x^2 - 1|$
E. $y = |(x - 1)^2|$

Review of Basic Functions...

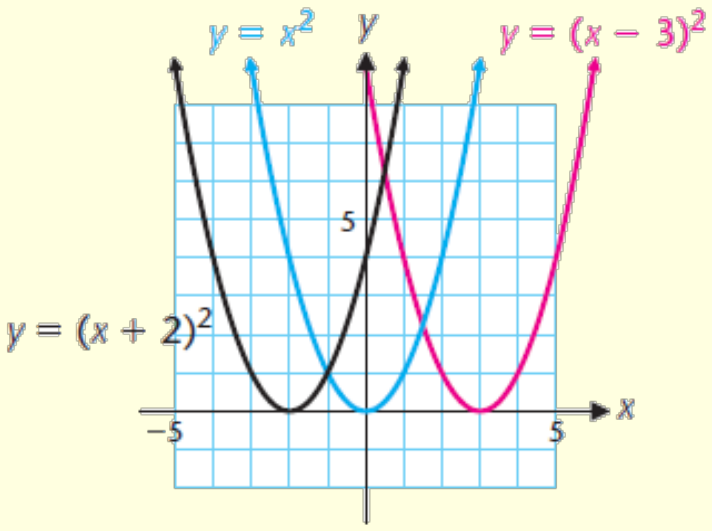


Vertical and Horizontal Shifts

(A) How are the graphs of $y = x^2 + 2$ and $y = x^2 - 3$ related to the graph of $y = x^2$? Confirm your answer by graphing all three functions in the same coordinate system.



(B) How are the graphs of $y = (x + 2)^2$ and $y = (x - 3)^2$ related to the graph of $y = x^2$? Confirm your answer by graphing all three functions in the same coordinate system.



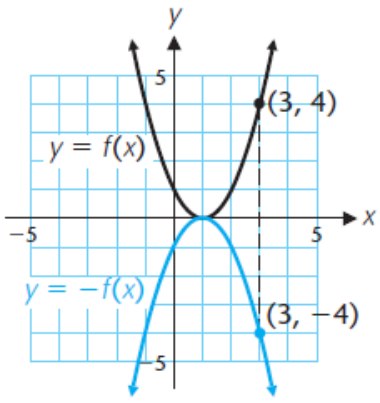
Reflecting the Graph of a Function

Let $f(x) = (x - 1)^2$.

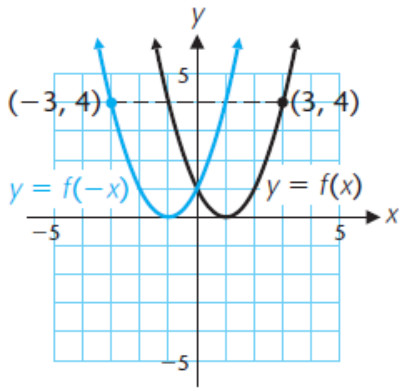
(A) How are the graphs of $y = f(x)$ and $y = -f(x)$ related? Confirm your answer by graphing both functions in the same coordinate system.

(B) How are the graphs of $y = f(x)$ and $y = f(-x)$ related? Confirm your answer by graphing both functions in the same coordinate system.

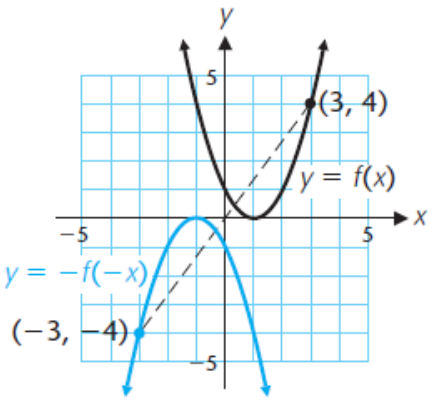
(C) How are the graphs of $y = f(x)$ and $y = -f(-x)$ related? Confirm your answer by graphing both functions in the same coordinate system.



(a)
$y = f(x)$ and $y = -f(x)$; reflection through the x axis



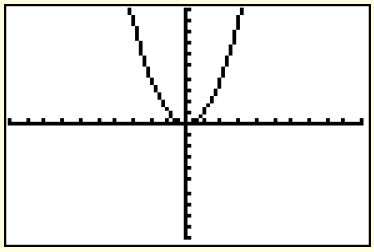
(b)
$y = f(x)$ and $y = f(-x)$; reflection through the y axis



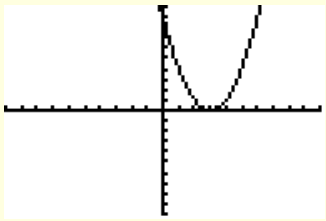
(c)
$y = f(x)$ and $y = -f(-x)$; reflection through the origin

Graph:

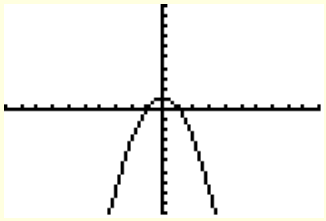
$y = x^2$



$y = (x - 3)^2$



$y = 1 - x^2 = -x^2 + 1$



Translations

A **translation** is a rigid transformation that shifts a function's graph up, down, left, right, or any combination. It does not change its size, shape, or orientation.

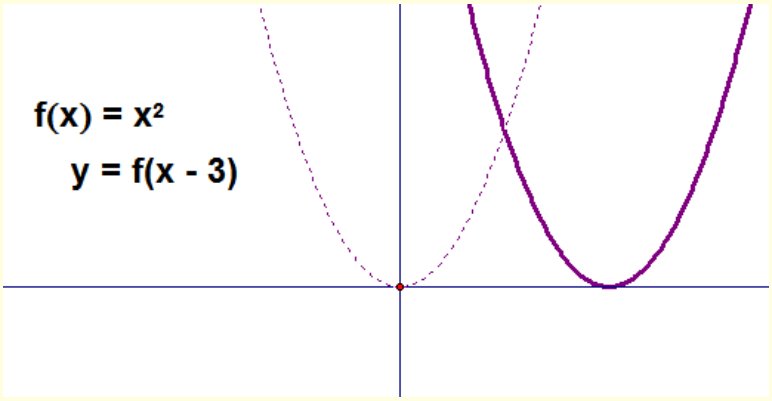
A **horizontal translation** moves a graph left or right. It is accomplished by adding or subtracting a constant to the domain values before plugging them into the function.

$y = f(x - c)$ will translate a graph to the right c units

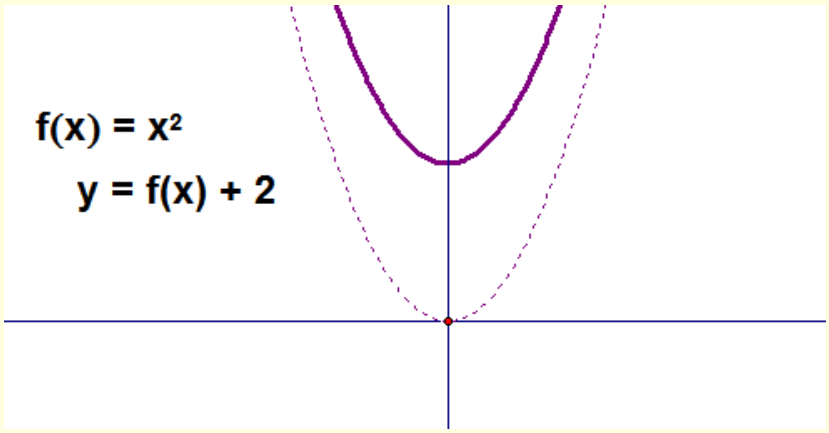
$y = f(x + c)$ will translate a graph to the left c units.

Example:

The parent graph has been translated 3 units to the right.



A **vertical translation** moves a graph up or down. It is accomplished by additing or subtracting a constant to the range values after they have been plugged into a function.
$y = f(x) + c$ will translate up by c units
$y = f(x) - c$ will translate down by c units.
Example:
The parent graph has been translated up 2 units.



http://mrwyatt.com/GSP/GSP_Precalc_translations.htm

3-3 Transformations of Functions (Rigid)

Basic Ideas of Transformations of Functions
http://archives.math.utk.edu/visual.calculus/0/shifting.4/index.html

Exploration: Vertical Translations
http://enlvm.usu.edu/ma/nav/activity.jsp?sid=__shared&cid=emready@trfns&lid=133&aid=3

Exploration: Horizontal Translations
http://enlvm.usu.edu/ma/nav/activity.jsp?sid=__shared&cid=emready@trfns&lid=133&aid=6

Exploration: Reflection over x-axis
http://enlvm.usu.edu/ma/nav/activity.jsp?sid=__shared&cid=emready@trfns&lid=135&aid=3

Exploration: Reflection over y-axis
http://enlvm.usu.edu/ma/nav/activity.jsp?sid=__shared&cid=emready@trfns&lid=135&aid=6

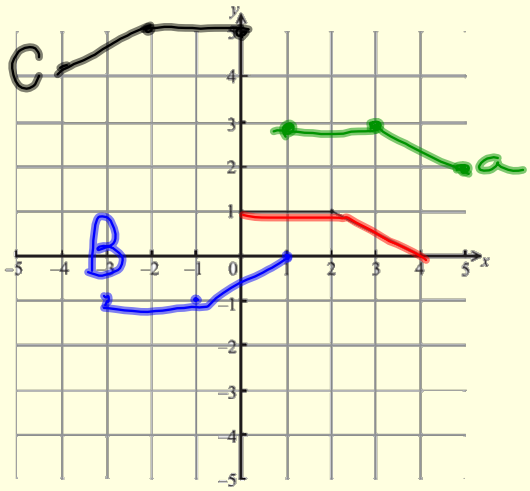
Interactive Quiz: Identifying Transformations
http://archives.math.utk.edu/visual.calculus/0/shifting.7/index.html

Interactive Quiz: Writing Transformations
http://archives.math.utk.edu/visual.calculus/0/shifting.7/index.html

3-3a Translations and Reflections

$f(x)$ Notation	Result	Examples: x^2 and $\|x\|$

The graph of the function $y = f(x), 0 \leq x \leq 4$ is shown below.



On the same graph, draw and label:

a) $f(x-1)+2$

b) $-f(x+3)$

c) $f(-x)+4$

Homework:

pages 199-201
(5-19 odd, 37, 63, 65, 69-75 odd)