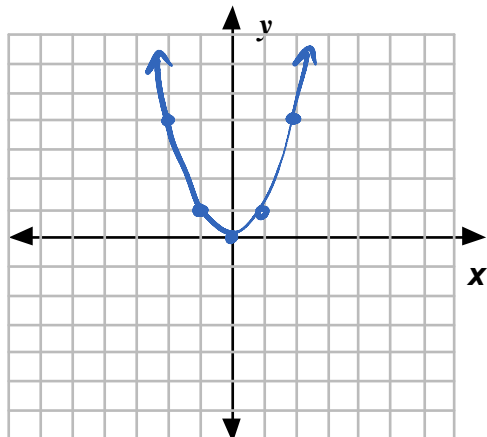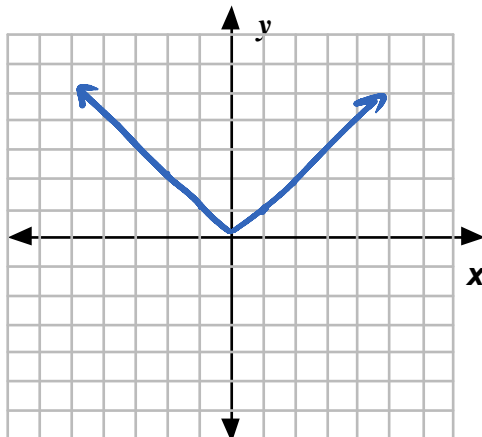# *1.1 Translating Functions*

Some graphs you may remember or recognize:
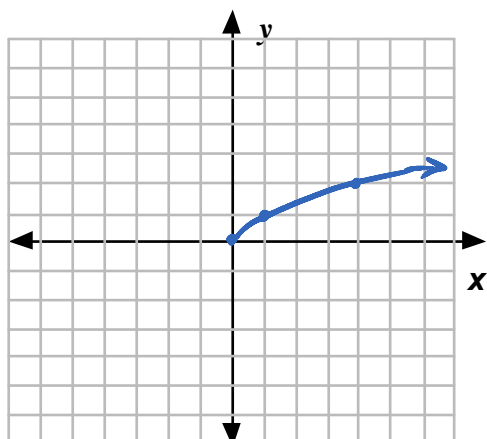
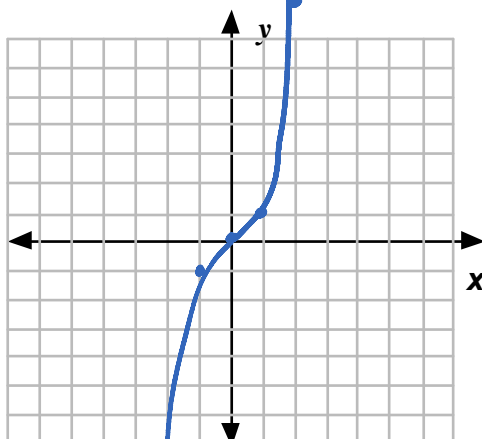$y = x^2$ $f(x) = |x|$

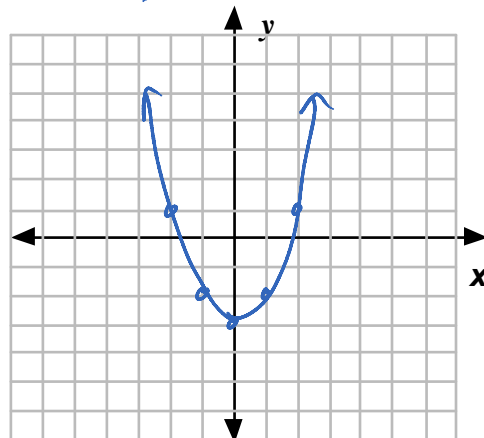$y = \sqrt{x}$ $f(x) = x^3$

x	y
0	0
1	1
4	2

What if we change $y = x^2$ into $y + 3 = x^2$, or more commonly, ___ $y = x^2 - 3$

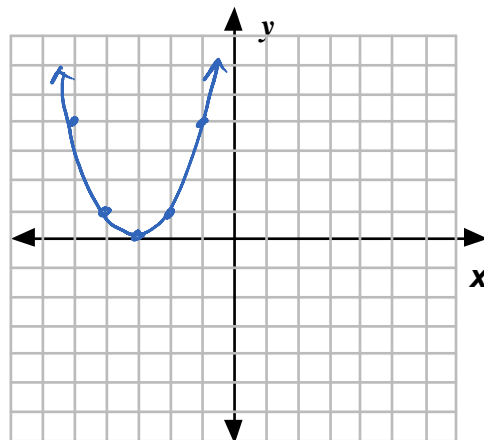parabola down 3

Check on gr. calc !!

PreCalculus 12

What if we change $y = x^2$ into $y = (x+3)^2$?

sideways 3 ?

gr. calc $\longrightarrow$ 3 left !

$x \longrightarrow x+3$ is opposite, just

as $y \rightarrow y+3$ was opposite too

- a **translation** of a function is a slide transformation that results in a shift of a graph without changing <u>its shape or orientation</u>.
- **vertical translations** are transformations with equations of the form:

  $y - k = f(x)$ or $y = f(x) + k$ $y - 5 = f(x)$ <u>up</u> 5

- **horizontal translations** are transformations with equations of the form

 $y = f(x - h)$ $y = f(x - 5)$ <u>right</u> 5

- a translated graph is <u>Congruent</u> to the original graph

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An alternate way of demonstrating a translation is by using **mapping notation**. A translation of "5 to the right" would be written as $(x , y) \rightarrow (x+5, y)$, but in function notation, we would change $y = f(x)$ to <u>$y = f(x-5)$</u>.

Example 1: p. 8 – graph the functions $y = x^2$, $y - 2 = x^2$, and $y = (x - 5)^2$ on the same set of axes.
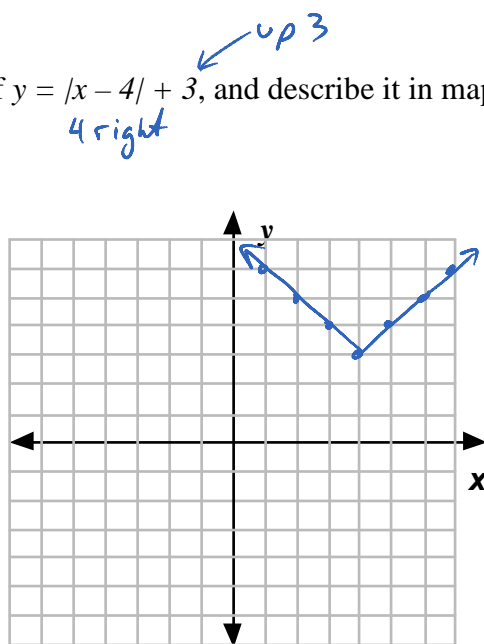
   Express the latter two graphs in mapping notation:

$(x,y) \rightarrow (x, y+2)$

$(x,y) \rightarrow (x+5, y)$
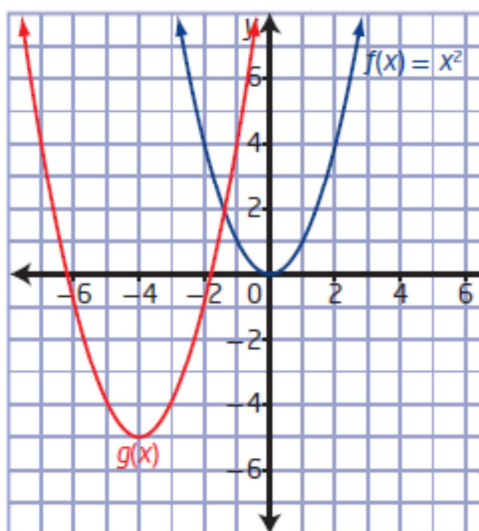
2

PreCalculus 12

up 3
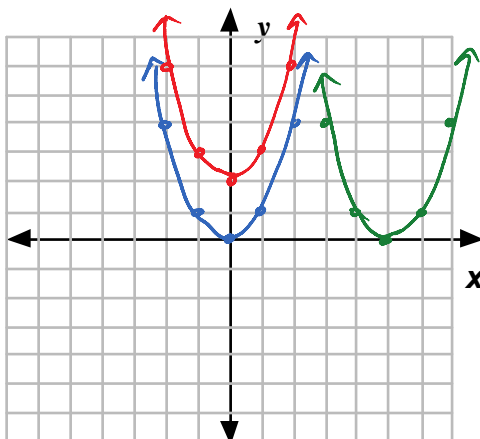
Example 2: p. 9 – sketch a graph of $y = |x – 4| + 3$, and describe it in mapping notation:

4 right

$(x,y) \to (x+4, y+3)$

Example 3: p. 10 - Determine the new equation of $g(x)$ from the original $f(x)$ in:

a)
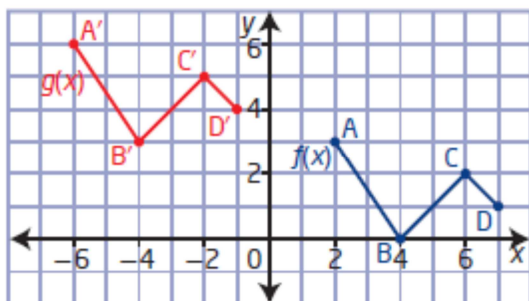

mapping notation: $(x,y) \to (x-4, y-5)$

translated $f(x)$ form: $g(x) = f(x+4) - 5$

explicit $g(x) = (x+4)^2 - 5$

b)

mapping notation: $(x,y) \to (x-8, y+3)$

translated $f(x)$ form: $g(x) = f(x+8) + 3$

explicit $g(x) = $? don't know equation for $g(x)$!

Assignment: p. 12 # 2-5(ab), 6-8, 11, 17, 19(calc), C3

3