4.1 – Translating Graphs of Functions

In this chapter, we will look at various ways of transforming (changing) graphs of functions.

There are many types of transformations we can make; one of these is **translations**.

A translation is a vertical or horizontal "shift" or "slide" left or right, up or down.

Complete "Construct your Understanding" on p. 162/163 in your worktext.

note: $y-1 = |x|$ is the same as $y = |x| + 1$

In General: If $y = f(x)$, then:

$$y = f(x-h) \quad \text{if } h > 0, \text{ then translate right}$$
$$h < 0, \text{ then translate left}$$

$y = f(x-3)$
$y = f(x+3)$

$$y - k = f(x) \quad \text{if } k > 0, \text{ then translate up}$$
$$\text{or} \quad y = f(x) + k \qquad k < 0, \text{ then translate down}$$

$y = f(x) + 3$
$y = f(x) - 3$

Example #1: Describe each translation to the graph of $y = f(x)$.

a) $y = f(x - 3)$

right 3 units

b) $y = f(x + 3)$

left 3 units

c) $y - 3 = f(x) \Rightarrow y = f(x) + 3$

up 3 units

d) $y = f(x) - 3$

down 3 units

e) $y + 3 = f(x + 1)$
$\Rightarrow y = f(x+1) - 3$
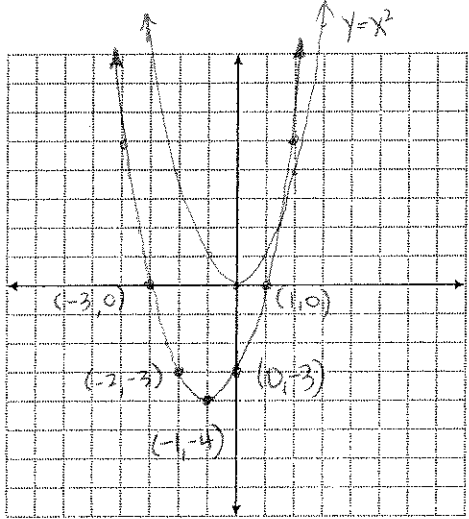
left 1 unit
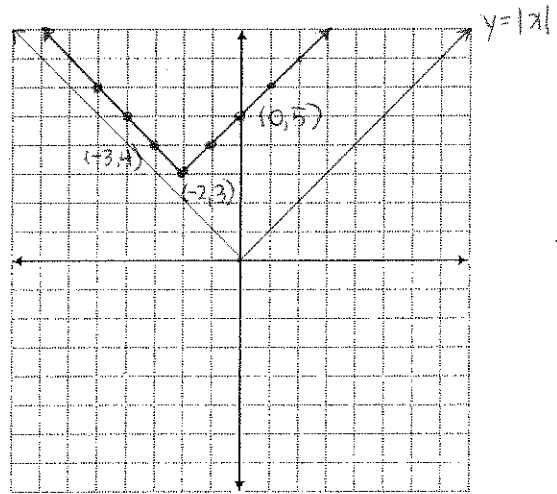down 3 units

f) $y = f(x + 3) - 1$

left 3 units
down 1 unit

Example #2: Describe the translation(s) for each function. Then, sketch the graph of each function.
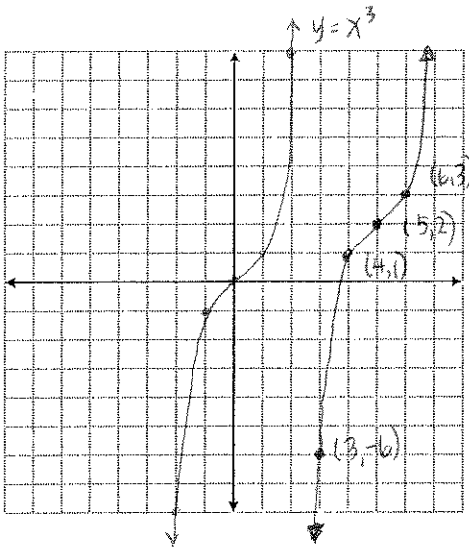
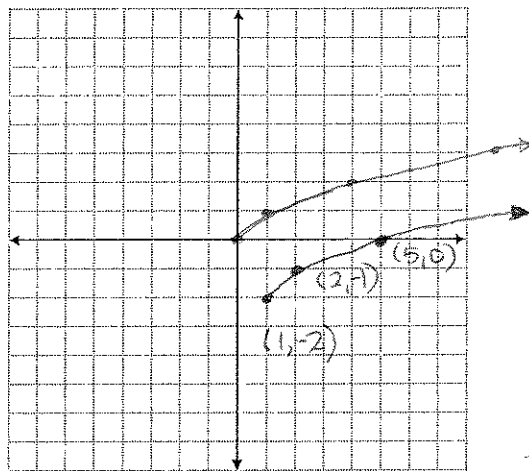a) $y = x^2$ and $y = (x+1)^2 - 4$ left 1   down 4

b) $y = |x|$ and $y = |x+2| + 3$ left 2   up 3

c) $y = x^3$ and $y = (x-5)^3 + 2$ right 5   up 2

d) $y = \sqrt{x}$ and $y + 2 = \sqrt{x-1}$ $\Rightarrow$ $y = \sqrt{x-1} - 2$ right 1   down 2

Homework: p. 169 #4 – 16