1.1: Horizontal and Vertical Translations

Review: General Graphs:

Quadratic: $y = x^2$

Square Root Graphs: $y = \sqrt{x}$

Absolute Value Graphs: $y = |x|$

Cubic Graphs: $y = x^3$

Reciprocal Graphs: $y = \frac{1}{x}$

Transformations:

A **transformation** of a function changes the equation and the location/shape/orientation of the graph.

Points on the original graph correspond to new points on the transformed image; the relationship is called **mapping**.

Example 1:

Consider and graph the following functions:

A.) $y = x^2$, $y = x^2 + 1$ and $y = (x + 1)^2$

B.) $y = \sqrt{x}$, $y - 2 = \sqrt{x}$ and $y = \sqrt{x - 2}$

C.) $y = \frac{1}{x}$, $y = \frac{1}{x} - 3$ and $y = \frac{1}{x-3}$

What do you notice about each graph?

Translations:

Horizontal translation: $y = f(x - h)$

$\mathrm{h} > 0$ translates right *h*

$\mathrm{h} < 0$ translates left *h*

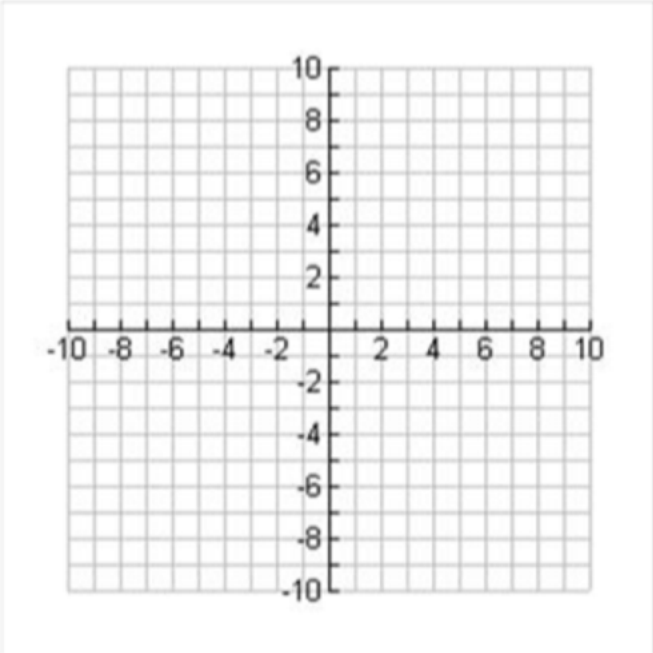
Vertical translation: $y - k = f(x)\ OR\ y = f(x) + k$

$k > 0$ translates up *k*

$k < 0$ translates down *k*

Example 2:

Graph $y = \sqrt{x}$ and $y = \sqrt{x+3} - 2$



Example 3:

Given point (1, 2) is in $y = f(x)$.

i. What is the new point after the following translations?

ii. How can you describe the mapping that has taken place?

a.) $y = f(x + 3)$

b.) $y - 3 = f(x)$

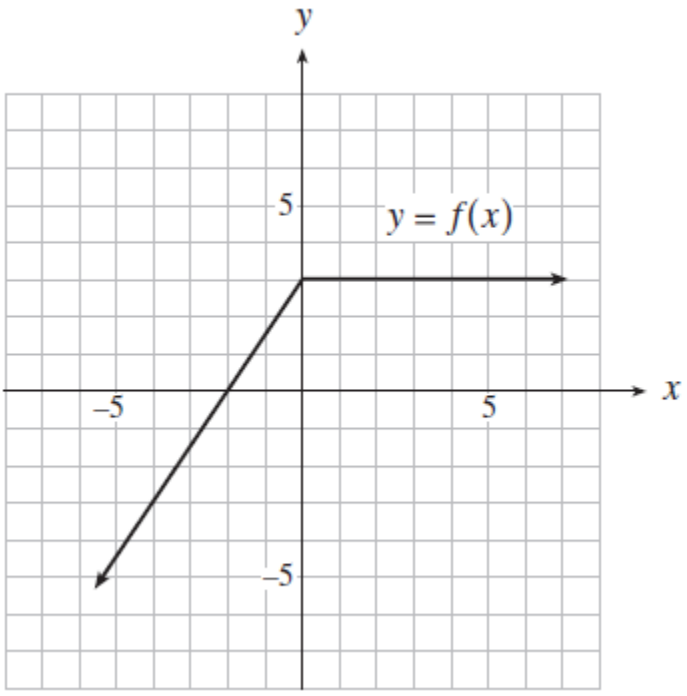
c.) $y = f(x) - 1$

d.) $y + 2 = f(x - 4)$

e.) $y = f(x + 1) - 2$

Example 4:

Given the graph of $y = f(x)$, graph $y - 1 = f(x + 2)$



Example 5:

Describe the translation that has been applied to the graph of $f(x)$ to obtain $g(x)$