

3.6**Learning Target: Understand how to write and graph linear functions.**

I can describe transformations of graphs of linear functions.

Write the meaning of each vocabulary term.

family of functions - a group of functions that have similar characteristics.

- now we are studying the family of linear functions.

parent function - the most basic function in the family

- parent linear function $y = x$

$$f(x) = x$$

transformation - changes the size, shape, position or orientation of a graph

Notes:

3.6 Notetaking with Vocabulary (continued)

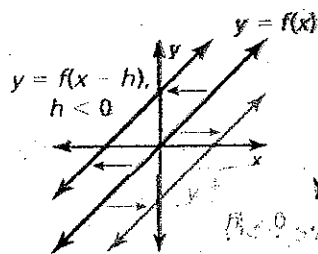
Core Concepts

A **translation or shift** is a transformation that shifts a graph horizontally or vertically but does not change the size, shape, or orientation of the graph.

Horizontal Shifts / Translations right/left

The graph of $y = f(x - h)$ is a horizontal shift of the graph of $y = f(x)$, where

$$h \neq 0.$$



Add / Subtr.
to the input
Changes x coord.

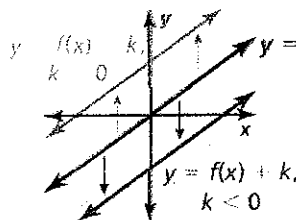
Subtracting h from the *inputs* before evaluating the function shifts the graph left when $h < 0$ and right when $h > 0$.

Notes: Add to input \rightarrow move left
Sub. from input \rightarrow move right

Vertical Shifts / Translations up/down

The graph of $y = f(x) + k$ is a vertical shift of the graph of $y = f(x)$, where

$$k \neq 0.$$



Add / Subtract
to the output
Changes y coord.

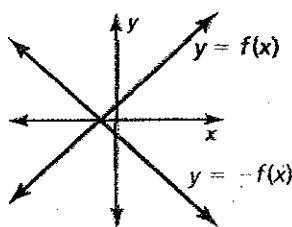
Adding k to the *outputs* shifts the graph down when $k < 0$ and up when $k > 0$.

Add to output \rightarrow move up
Subtract from output \rightarrow move down
(Lines are here)

A **reflection** is a transformation that flips a graph over a line called the *line of reflection or symmetry*.

Reflections in the x-axis

The graph of $y = -f(x)$ is a reflection in the x -axis of the graph of $y = f(x)$.

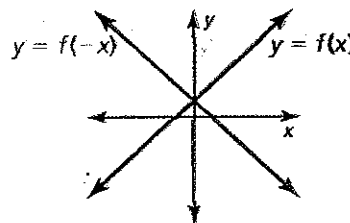


\bullet y by -1
flip over
 x -axis

Multiplying the outputs by -1 changes their signs.

Reflections in the y-axis

The graph of $y = f(-x)$ is a reflection in the y -axis of the graph of $y = f(x)$.



\bullet x by -1
flip over
 y -axis

Multiplying the inputs by -1 changes their signs.

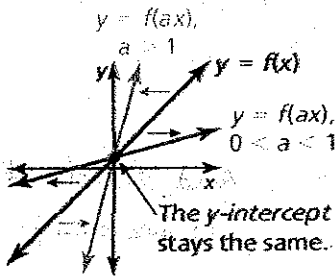
3.6

Notetaking with Vocabulary (continued)

• Multiplying/Dividing

Horizontal Stretches and Compressions

The graph of $y = f(ax)$ is a horizontal stretch or shrink by a factor of $\frac{1}{a}$ of the graph of $y = f(x)$, where $a > 0$ and $a \neq 1$.



Notes:

if $|m| > 0$
horizontal compression

if $0 < |m| < 1$
horizontal stretch

Transformations of Graphs

The graph of $y = a \cdot f(x - h) + k$ or the graph of $y = f(ax - h) + k$ can be obtained from the graph of $y = f(x)$ by performing these steps.

Step 1 Reflect the graph of $y = f(x)$ over the y -axis or x -axis when $a < 0$.

Step 2 Use a to stretch or compress the resulting graph from Step 1.

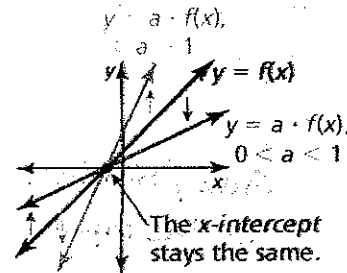
Step 3 Translate the resulting graph from Step 2 horizontally h units.

Step 4 Translate the resulting graph from Step 3 vertically k units.

Notes:

Vertical Stretches and Compressions

The graph of $y = a \cdot f(x)$ is a vertical stretch or shrink by a factor of a of the graph of $y = f(x)$, where $a > 0$ and $a \neq 1$.



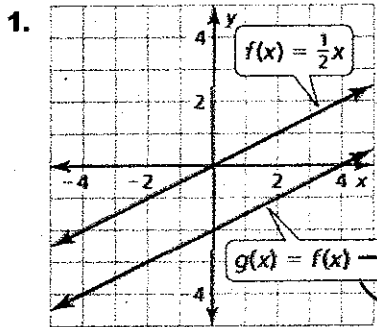
if $|m| > 0$
vertical stretch

if $0 < |m| < 1$
vertical compression

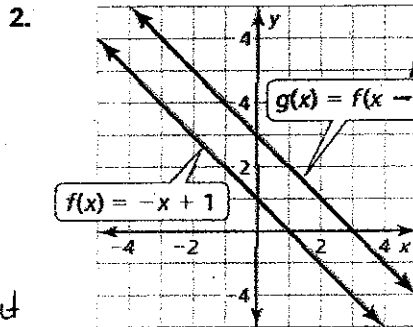
3.6 Notetaking with Vocabulary (continued)

Practice

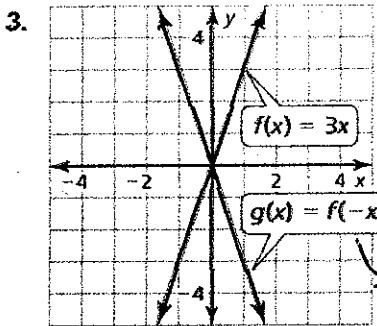
In Exercises 1–6, use the graphs of f and g to describe the transformation from the graph of f to the graph of g .



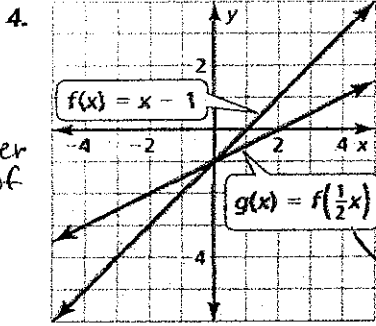
$g(x)$ is a vertical shift down 2 of $f(x)$.
to the output changes y 's.



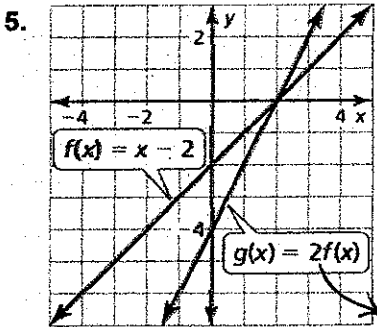
to the input changes x 's
 $g(x)$ is a horizontal shift right 2 of $f(x)$



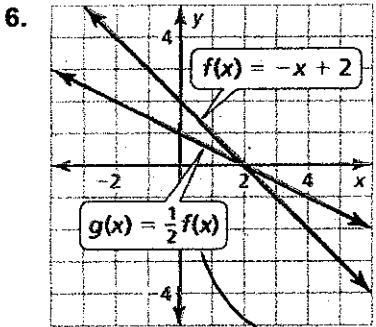
$g(x)$ is a horizontal reflection over the y -axis of $f(x)$
to the input, changes x 's.



$g(x)$ is a horizontal stretch of $f(x)$
to the input, changes x 's

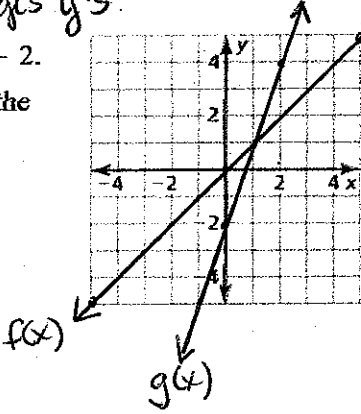


$g(x)$ is a vertical stretch of $f(x)$
to the output, changes y 's.



$g(x)$ is a vertical compression of $f(x)$
to the output, changes y 's

7. Graph $f(x) = x$ and $g(x) = 3x - 2$. Describe the transformations from the graph of f to the graph of g .



$g(x)$ is a vertical stretch and a shift down 2 of $f(x)$.