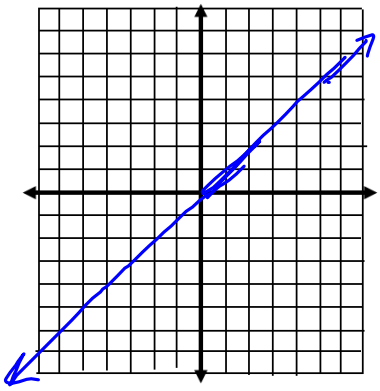
1.3 Transforming Linear Functions

Objectives: Students will transform linear functions.
Students will solve problems involving linear transformations.

Parent Function: the simplest function in the family of functions.

The parent function for a linear function is f(x) = x or y = x.

Every linear function is a **translation** of the parent function.



A translation moves the graph right, left, up or down. The translation can also flip, stretch or compress the graph.

General form of a linear equation:

$f(x) = a(x - h) + k$

k represents the **vertical** translation

+ k move UP
- k move DOWN

a represents the **slope** of the line,
if a is negative the graph is **flipped**

h represents the **horizontal** translation
(x + h) move LEFT
(x - h) move RIGHT

Ex. 1 Let $g(x)$ be the indicated transformation of $f(x)$. Write the rule for $g(x)$. Graph both functions and compare.

$f(x) = x - 2$, horizontal translation right 3 units

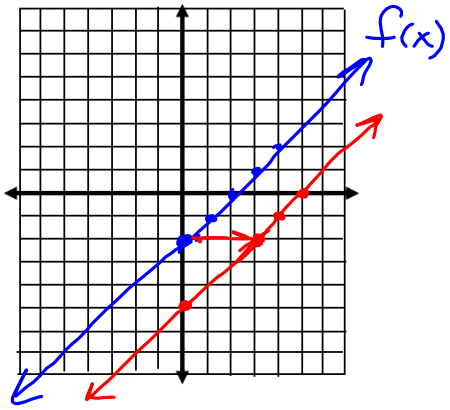
$g(x) = 1x - 5$

$1(x - 3) - 2$

right 3

$= x - 3 - 2$

$g(x) = x - 5$



Ex. 2
Let $g(x)$ be the indicated transformation of $f(x)$. Write the rule for $g(x)$.

x	–2	0	2
$f(x)$	0	1	2

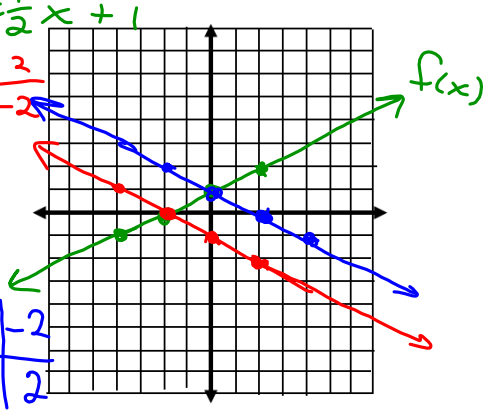
linear function defined in the table;
a. reflection across x-axis

$f(x) = \frac{1}{2}x + 1$

$g(x) = -\frac{1}{2}x - 1$

x stays same & y changes sign

x	–2	0	2
$g(x)$	0	–1	–2



b. reflection across the y-axis

$g(x) = \frac{-1}{2}x + 1$

x	2	0	–2
$g(x)$	0	1	2

x changes sign & y stays the same

Ex. 3 Let $g(x)$ be the indicated transformation of $f(x)$. Write the rule for $g(x)$. Graph both functions and compare.

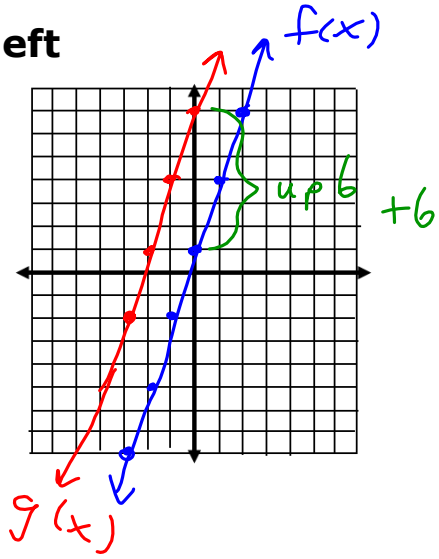
$f(x) = 3x + 1$; translation 2 units left

$m = \frac{3}{1}$

$g(x) = 3x + 7$

$g(x) = 3(x+2) + 1$

$g(x) = 3x + 6 + 1$



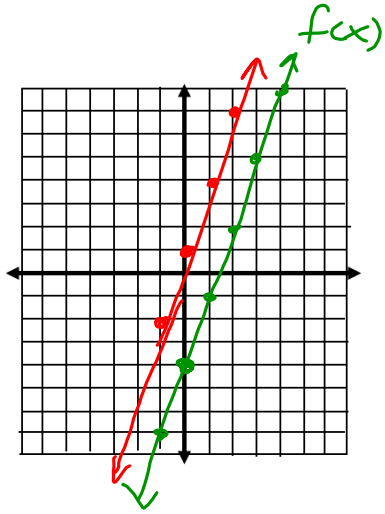
Ex. 4 Let $g(x)$ be the indicated transformation of $f(x) = 3x - 4$. Write the rule for $g(x)$. Graph both functions and compare.

$f(x) = 3x - 4$; vertical shift 5 units up

$m = \frac{3}{1}$

$g(x) = 3x - 4 + 5$

$g(x) = 3x + 1$



Ex. 5
The golf team is selling T-shirts as a fund-raiser. The function R(*n*) = 7.5*n* represents the team's revenue in dollars, and *n* is the number of t-shirts sold.

The team paid $60 for the T-shirts. Write a new function *P*(*n*) for the team's profit. Describe the translation from R(n) to P(n).

profit = revenue − cost

$P(n) = R(n) - 60$

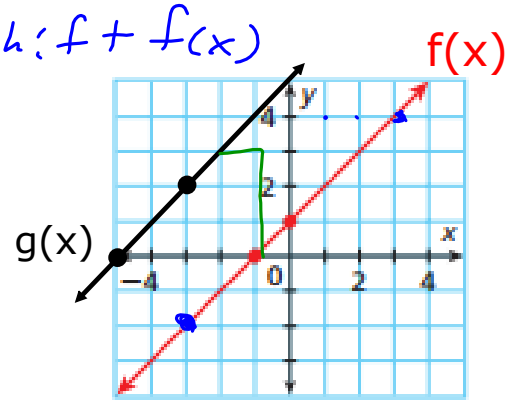
$P(n) = 7.5n - 60$

P(n) is just R(n) shifted down 60.

Ex. 6 Given f(x) and g(x), state the translation from f(x) to g(x).

Write the equation for each function.

To get g(x), shift f(x) either up 4 or left 4



$f(x) = x + 1$

$g(x) = x + 5$