Warm Up:

Find new seats!

Your group should be composed of all new people, no repeats from the last time.

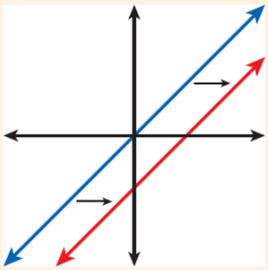
"Nothing is impossible, the word itself says 'I'm possible'!"

-Audrey Hepburn

Today we are going to look at transforming functions. We have briefly touched upon this but will look now using an investigation on what happens to the functions.

2-6 Transforming Linear Functions

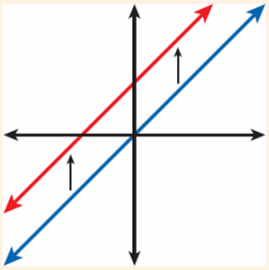
Horizontal Shift of $|h|$ Units



Input value changes.
$f(x) \rightarrow f(x - h)$
$h > 0$ moves right $h < 0$ moves left

2-6 Transforming Linear Functions

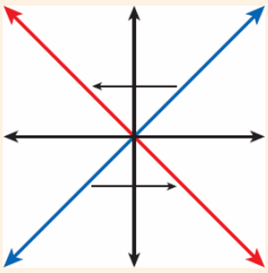
Vertical Shift of $|k|$ Units



Output value changes.
$f(x) \rightarrow f(x) + k$
$k > 0$ moves up
$k < 0$ moves down

2-6 Transforming Linear Functions

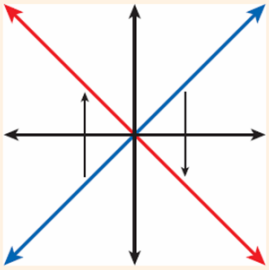
Reflection Across y-axis



Input value changes.
$f(x) \rightarrow f(-x)$
The lines are symmetric about the y-axis.

2-6 Transforming Linear Functions

Reflection Across *x*-axis



Output value changes.
$f(x) \rightarrow -f(x)$
The lines are symmetric about the *x*-axis.

2-6 Transforming Linear Functions

Helpful Hint

To remember the difference between vertical and horizontal translations, think:

"Add to *y*, go high."

"Add to *x*, go left."

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

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

$(x-3) - 2$

$g(x) = x - 3 - 2$

$g(x) = x - 5$

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

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

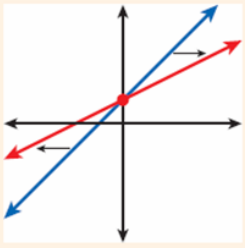
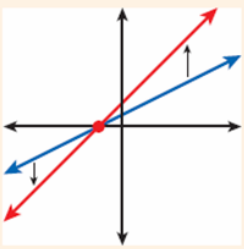
$3(x-2) + 1$

$3x - 6 + 1$

$3x - 5$

Stretches and compressions change the slope of a linear function. If the line becomes steeper, the function has been stretched vertically or compressed horizontally. If the line becomes flatter, the function has been compressed vertically or stretched horizontally.

Stretches and Compressions

Horizontal	Vertical
Horizontal Stretch/Compression by a Factor of b	**Vertical Stretch/Compression by a Factor of a**
 Input value changes. $f(x) \rightarrow f\left(\frac{1}{b}x\right)$	 Output value changes. $f(x) \rightarrow a \cdot f(x)$
$b > 1$ stretches away from the y-axis. $0 < \lvert b \rvert < 1$ compresses toward the y-axis.	$a > 1$ stretches away from the x-axis. $0 < \lvert a \rvert < 1$ compresses toward the x-axis.

Let $g(x)$ be a horizontal compression of $f(x) = -x + 4$ by a factor of $\frac{1}{2}$. Write the rule for $g(x)$, and graph the function.

$-\left(\frac{1}{1/2}x\right)+4$

$-(2x)+4$

$-2x+4$

Let $g(x)$ be a vertical compression of $f(x) = 3x + 2$ by a factor of $\frac{1}{4}$. Write the rule for $g(x)$ and graph the function.

$\frac{1}{4}(3x+2)$

$\frac{3}{4}x+\frac{1}{2}$

Let $g(x)$ be a horizontal shift of $f(x) = 3x$ left 6 units followed by a horizontal stretch by a factor of 4. Write the rule for $g(x)$.

$3(x+6)$

$3x+18$

$3\left(\frac{1}{4}x\right)+18$

$\frac{3}{4}x+18$

Let $g(x)$ be a vertical compression of $f(x) = x$ by a factor of $\frac{1}{2}$ followed by a horizontal shift 8 left units. Write the rule for $g(x)$.

$f(x)=x$

$\frac{1}{2}x$

$\frac{1}{2}(x+8)$

$\frac{1}{2}x+4$

Homework:

p. 138 # 2-4, 8-10,13-18, 21, 28