STRETCHES *Key*
SHRINKS

DAY 1

All of the previous transformations we have looked at (horizontal and vertical shifts, and reflections) are what are called __congruent__ transformations. Meaning, the size/shape of the figure __does not__ change. Instead, the __orientation__ of the figure in the plane is the only thing that changes.

Today, we are looking at what are called __non-congruent__ transformations. Meaning, the size/shape of the figure __does__ change.

Vertical Stretches and Shrinks:

Recall: All vertical transformations affect the __y__ coordinates. Such as: __shifting up/down__ and __reflecting over the x-axis__. Likewise, they always occur __outside__ the function. i.e $x^2 + 2$; $-|x|$; $f(x) - 4$; $-f(x)$

When a figure gets stretched or shrunk vertically, it means the function is being _____ by some number. In order to find the new points, we need to __multiply__ the __y__ coordinates by that same number.

Example: You are given f(x). Draw the transformation: $3f(x)$.
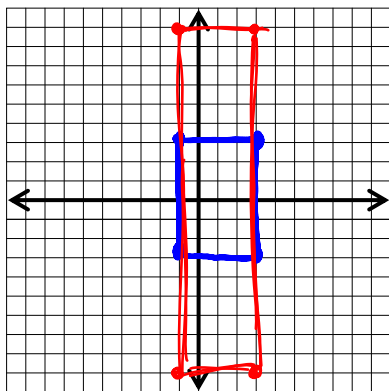
Transformation:
__Vertical Stretch by 3__
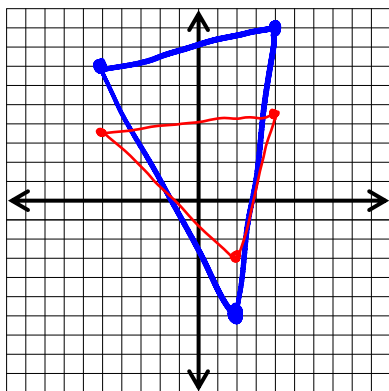
Original Points:
(-1, 3)
(-1, -3)
(3, 3)
(3, -3)

New Points:
(-1, 9)
(-1, -9)
(3, 9)
(3, -9)

Which coordinate will be affected? __y__

What will you do to that coordinate? __multiply by 3__

Example: You are given f(x). Draw the transformation: $\dfrac{1}{2}f(x)$.

Transformation:
__Vertical Shrink by $\frac{1}{2}$__
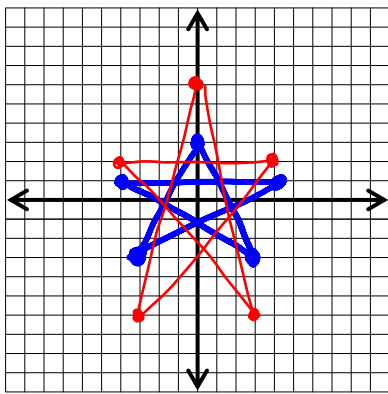
Original Points:
(-5, 7)
(4, 9)
(2, -6)

New Points:
(-5, 3.5)
(4, 4.5)
(2, -3)

Which coordinate will be affected? __y__

What will you do to that coordinate? __multiply by 3__

Example: You are given f(x). Draw the transformation: $2f(x)$.

Transformation:
Vertical
Stretch
by 2

Original Points:
$(-4, 1)$
$(0, 3)$
$(4, 1)$
$(-3, -3)$
$(3, -3)$

New Points:
$(-4, 2)$
$(0, 6)$
$(4, 2)$
$(-3, -6)$
$(3, -6)$

Which coordinate will be affected? Y

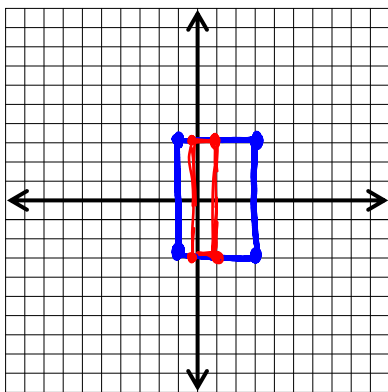What will you do to that coordinate? multiply by 2

Horizontal Stretches and Shrinks:

Recall: All horizontal transformations affect the __X__ coordinates. Such as: shift right/left and __reflect over the y-axis__. Likewise, they always occur __inside__ the function. i.e $(x+2)^2$; $|-x|$; $f(x-4)$; $f(-x)$

When a figure gets stretched or shrunk horizontally, it means the x's are being _____ by some number. In order to find the new points, we need to __multiply__ the __X__ coordinates by the __reciprocal__ of the number.

Remember – for horizontal transformations, do the **_opposite_** of what you think is going to happen!

Example: You are given f(x). Draw the transformation: $f(3x)$.

Transformation:
horizontal
shrink
by
$\frac{1}{3}$
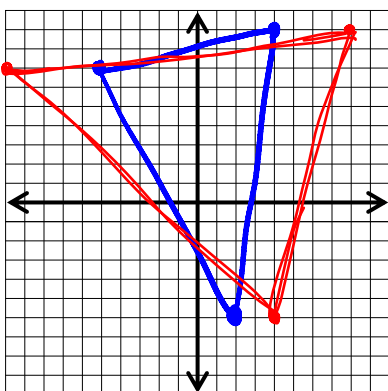
Original Points:
$(-1, 3)$
$(-1, -3)$
$(3, 3)$
$(3, -3)$

New Points:
$(-\frac{1}{3}, 3)$
$(-\frac{1}{3}, 3)$
$(1, 3)$
$(1, -3)$

Which coordinate will be affected? X

What will you do to that coordinate? multiply by $\frac{1}{3}$

Example: You are given f(x). Draw the transformation: $f\left(\frac{1}{2}x\right)$.

Transformation:
horizontal
stretch
by
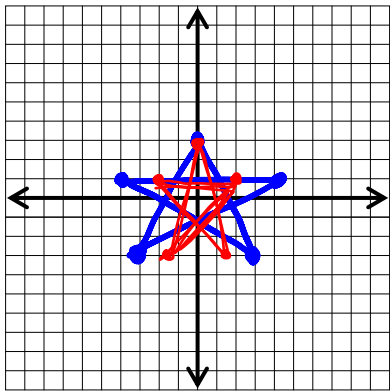$\frac{2}{1}$

Original Points:
$(-5, 7)$
$(4, 9)$
$(2, -6)$

New Points:
$(-10, 7)$
$(8, 9)$
$(4, -6)$

Which coordinate will be affected? X

What will you do to that coordinate? multiply by 2

Example: You are given f(x). Draw the transformation: $f(2x)$.

Transformation:	Original Points:	New Points:
horizontal shrink by $\frac{1}{2}$	(-4, 1)	(-2, 1)
	(0, 3)	(0, 3)
	(4, 1)	(2, 1)
	(-3, -3)	(-1.5, -3)
	(3, -3)	(1.5, -3)

Which coordinate will be affected?   x

What will you do to that coordinate?   multiply by $\frac{1}{2}$