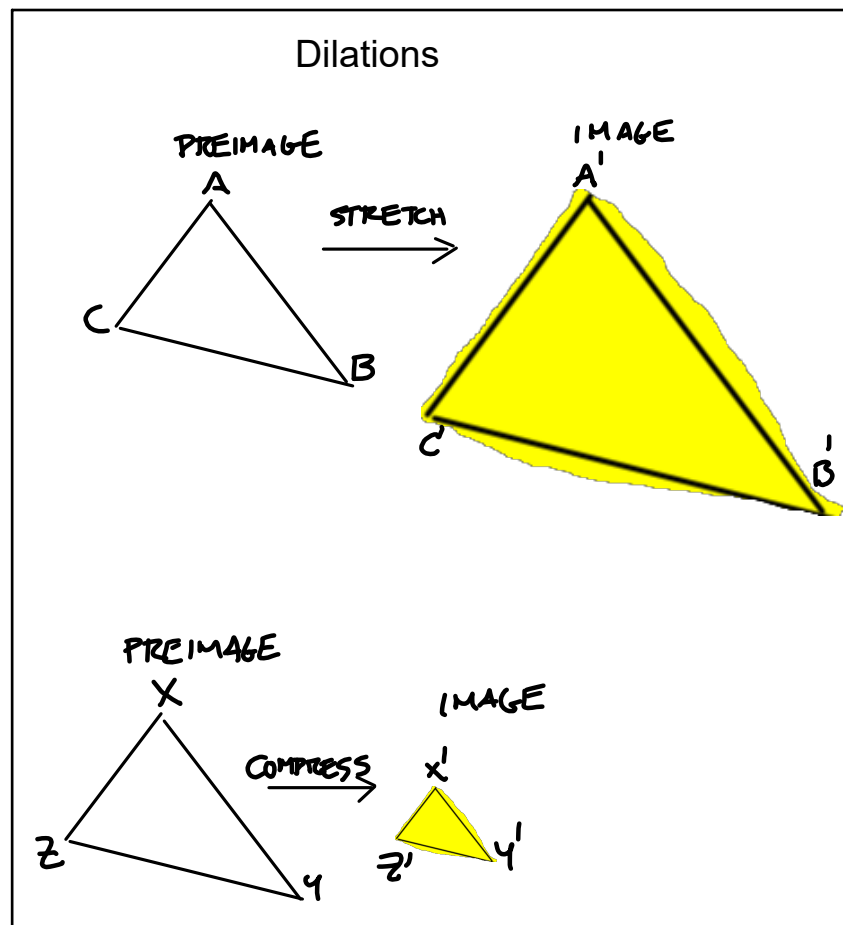




The Math Dawg

Introduction to Horizontal and Vertical Stretches and Compressions of Functions Using $f(x)$ Function Notation

Jul 17-1:49 PM



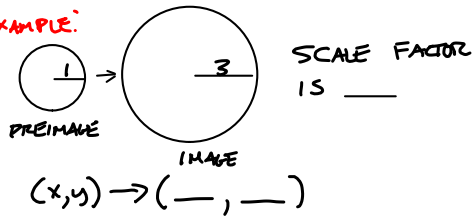
Dilations

WHEN THE SAME STRETCH/COMPRESSION IS APPLIED TO ALL LENGTHS OF A FIGURE WE CAN TALK ABOUT THE "SCALE FACTOR".

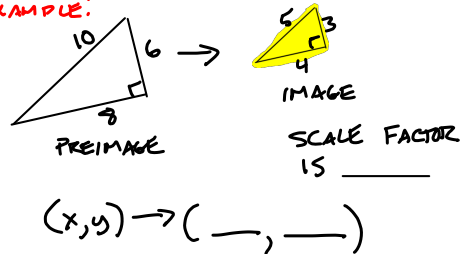
THE SCALE FACTOR IS SOME MULTIPLIER.
SCALE FACTOR > 1 $\rightarrow$ STRETCH
SCALE FACTOR < 1 $\rightarrow$ COMPRESSION

THE FIGURES WILL BE "SIMILAR".
THEY WILL HAVE THE SAME SHAPE.

EXAMPLE:



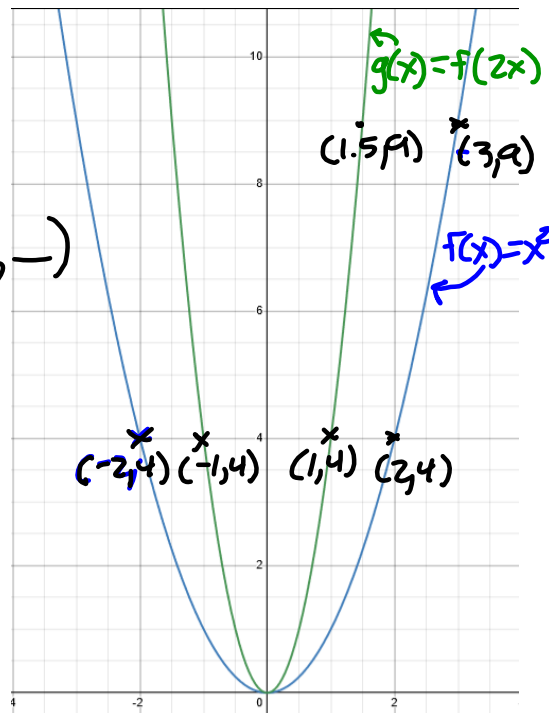
EXAMPLE:



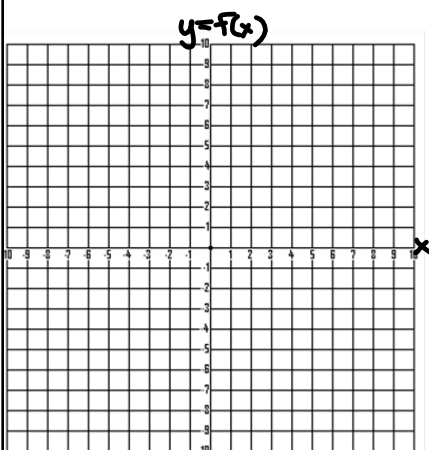
WE ARE NOT USUALLY DOING DILATIONS HERE!!

f AND g
ARE NOT
SIMILAR.
 $(x, y) \rightarrow (__, __)$

 x AND y
ARE NOT
CHANGED BY
THE SAME
MULTIPLE.



$f(x) = x^2$ Vertical stretch of a function



x	f(x)	2f(x)
-3		
-2		
-1		
0		
1		
2		
3		

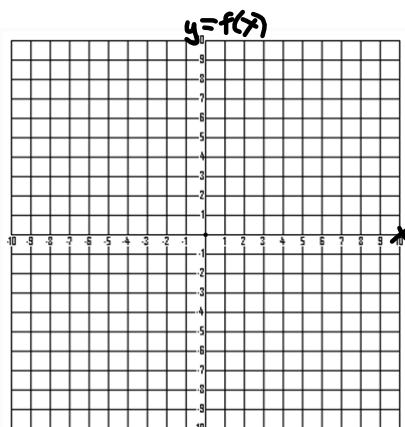
$(x, y) \rightarrow (—, —)$

MAGNIFICATION FACTOR: 2

EACH POINT GETS STRETCHED 2 TIMES
WITH RESPECT TO THE X-AXIS

Vertical shrink/compression of a function

$$f(x) = x^2$$



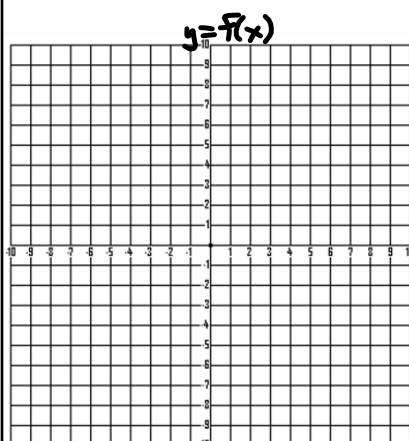
x	f(x)	$\frac{1}{2}f(x)$
-3		
-2		
-1		
0		
1		
2		
3		

$(x, y) \rightarrow (—, —)$

MAGNIFICATION FACTOR: $\frac{1}{2}$ OR 0.5

EACH POINT GETS PULLED IN $\frac{1}{2}$ THE
DISTANCE TO THE X-AXIS

$f(x) = x^2$ Horizontal compression/
shrink of a function



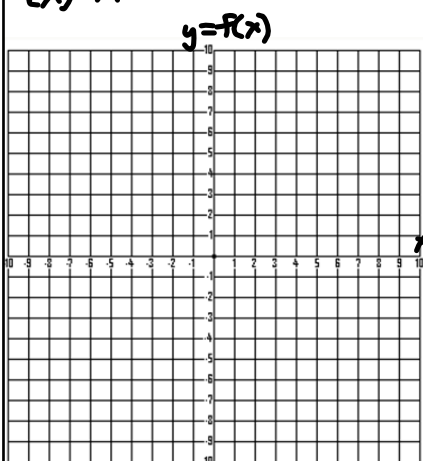
x	f(x)	x	f(2x)
-3			
-2			
-1			
0			
1			
2			
3			

$(x, y) \rightarrow (-, -)$

MAGNIFICATION FACTOR: RECIPROCAL OF $2 \rightarrow \frac{1}{2}$

EACH POINT GETS PULLED $\frac{1}{2}$ THE
DISTANCE TO THE y-AXIS

$f(x) = x^2$ Horizontal stretch/expansion of a function



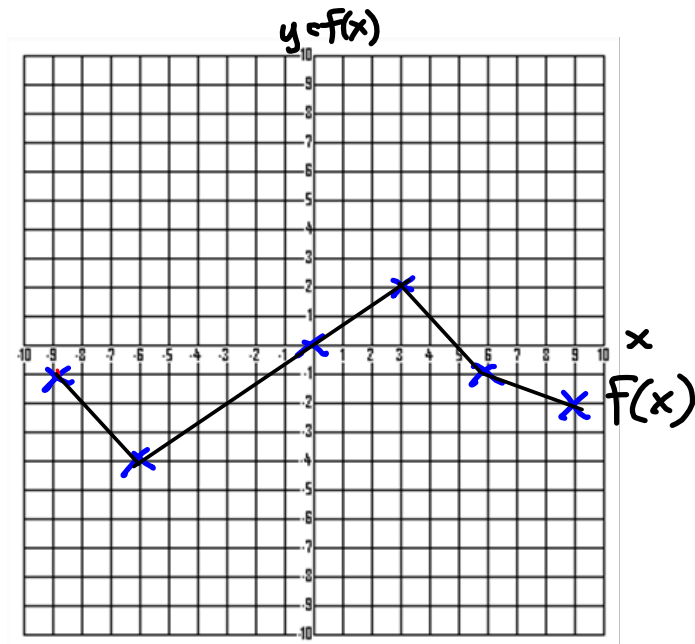
x	f(x)	x	f($\frac{1}{2}x$)
-3			
-2			
-1			
0			
1			
2			
3			

$(x, y) \rightarrow (-, -)$

MAGNIFICATION FACTOR: THE RECIPROCAL
OF $\frac{1}{2} \rightarrow 2$

EACH POINT GETS STRETCHED TWICE THE
DISTANCE FROM THE y-AXIS

EXAMPLE! SKETCH $2f(3x)$



PLAY AROUND WITH HORIZONTAL
AND VERTICAL STRETCHES/
COMPRESSIONS ON DESMOS.COM

<https://www.desmos.com/>

INCLUDE A HORIZONTAL/VERTICAL
COMBINATION THAT DOES NOT CHANGE
THE GRAPH OF THE ORIGINAL FUNCTION

