

Quiz tomorrow 3.3

3.5 Graphing Transformations Cont'd

RECAP Let $k > 0$

$y = f(x) + k$ is $y = f(x)$ shifted up by k units

$y = f(x) - k$ " shifted down "

$y = f(x + k)$ " shifted left "

$y = f(x - k)$ " shifted right "

$y = -f(x)$ " vertically reflected
(reflected in x -axis)

$y = f(-x)$ " horizontally reflected
(reflected in y -axis)

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Start Graphing

Type: $y = \sqrt{x}$

⊕ to add more graphs

Can toggle each graph on/off

Vertical Stretch/Compression : Let $a > 0$

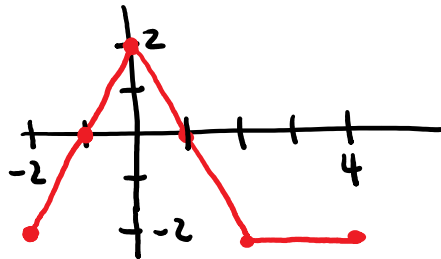
$y = af(x)$ multiplies each y -value of $y = f(x)$ by a

If $a > 1$ then it's a vertical stretch

If $0 < a < 1$ " vertical compression

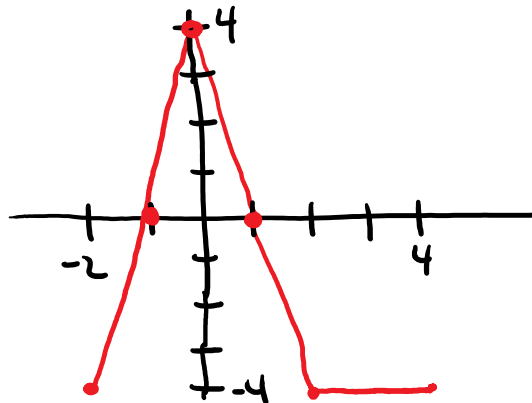
Ex:

$$y = f(x)$$

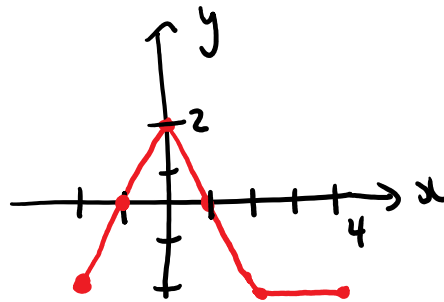


$$y = 2f(x)$$

"Vertical Stretch"
(each y -value is doubled)

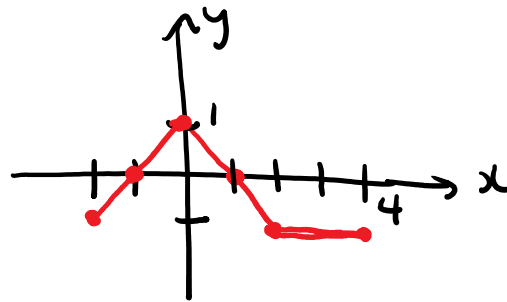


$$y = f(x)$$



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

"Vertical Compression"
(each y-value gets multiplied by $\frac{1}{2}$)
divided by 2



Horizontal Stretch / Compression: Let $a > 0$

$y = f(ax)$ divides each x-value by a

If $a > 1$ it's a horizontal compression

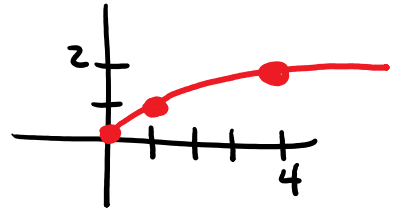
If $0 < a < 1$ " horizontal stretch

Counter-intuitive

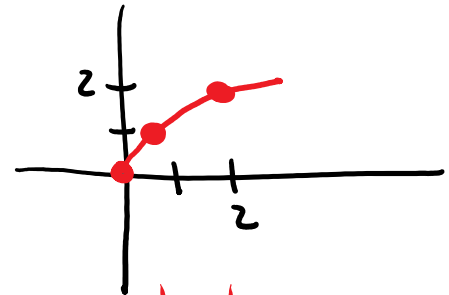
Ex: Graph $y = \sqrt{x}$ and $y = \sqrt{2x}$

x	$y = \sqrt{x}$
0	0
1	1
4	2

$$y = \sqrt{x}$$



x	$y = \sqrt{2x}$
0	0
$\frac{1}{2}$	$\sqrt{2 \cdot \frac{1}{2}} = \sqrt{1} = 1$
2	$\sqrt{4} = 2$

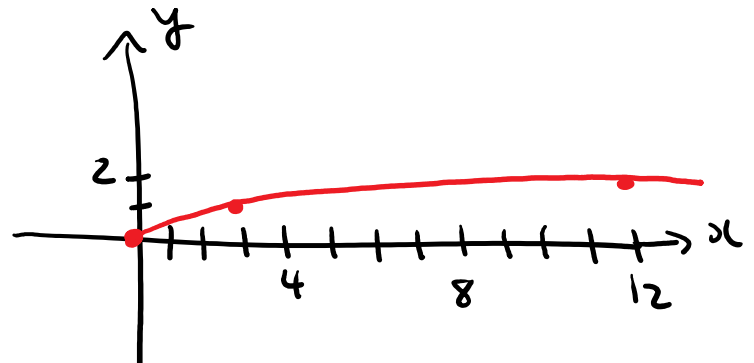


Horizontal
Compression

Ex: Graph $y = \sqrt{\frac{1}{3}x}$

Horizontal Stretch

x	$y = \sqrt{\frac{1}{3}x}$
0	0
3	1
12	2



Aside $y = \frac{1}{3}x^2$ Vertical Compression
 $y = \frac{1}{3}f(x)$ "
 $y = f(\frac{1}{3}x)$ Hor. Stretch