Transforming the graph of a function by shrinking or stretching

Stretching and shrinking is a tricky topic, but briefly: If the number is in front of the 'x' on the function, you pick a point on the graph, **<u>divide</u>** the x-value on the graph by that number, keep the y-value the same, and plot that point.

If the number is in front of the 'y' i.e. the 'f(x)' on the function, you pick a point on the graph, **multiply** the y-value by that number, keep the x-value the same, and plot that point.

See the follow two pages for examples.

Summary:

If you have **a**f(x), then pick a **y-value** on the graph and **MULTIPLY** by '**a**' keeping x the same.

Example: y = 3 f(x). If we have the point (3,7), then the new point would be: (3, **21**). (Multiply the y-value of '7' by '3,' the number in front of the function, f(x), to get the new y-value of '21.'

If you have f(**a**x), then pick an **x-value** on the graph and **DIVIDE** by '**a**' keeping y the same.

Example: y = f(3x). If we have the point (15,7), then the new point would be: (5,7). (Divide the x-value of '15' by '3,' the number in front of the function, f(x), to get the new x-value of '5.'

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The graph of y = f(x) is shown below.

Graph $y = f\left(\frac{1}{2}x\right)$.



For this graph, the number $\frac{1}{2}$ is in front of the 'x,' so we **DIVIDE** the x-values by $\frac{1}{2}$, which is the same as multiplying by the reciprocal, or '2.'

Pick a point, say, (2, -4). It's always best to pick the end points of the graph. Now, divide the x-value by $\frac{1}{2}$, which is the same as multiplying the x-value by the reciprocal, 2, and leave the y-value the same. That gives us the point (4, -4).

Do the same with the other end point, (-2,-2). Divide the x-value by $\frac{1}{2}$, which is the same as multiplying the x-value by the reciprocal, 2, and leave the y-value the same. That gives us the point (-4,-2).

Answer:



Draw a line between those two points, and you're done!

Transforming the graph of a function by shrinking or stretching

The graph of y = f(x) is shown below. Graph y = 2f(x).



Answer:



For this happy fellow, we have a number in front of the entire function, not just in front of the 'x,' so we **MULTIPLY** the y-value by that number, in this case, '2.'

Pick the endpoints again. Choose (0,0). Multiply the y-value by '2' and leave the x-value alone. That gives us the new point, (0,0).

Pick the vertex and repeat. The vertex is (2,4). Multiply the y-value by '2' and leave the x-value alone. That gives us a new vertex at ((2,8).

Pick the last endpoint at (4,0). Multiply the y-value by 2 and leave the x-value alone. That gives us the point, (4,0).

Plot the three points and connect the dots.