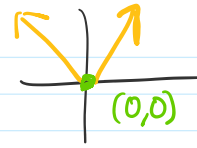


Week 2 - Transformations

Monday, September 23, 2019 11:38 AM

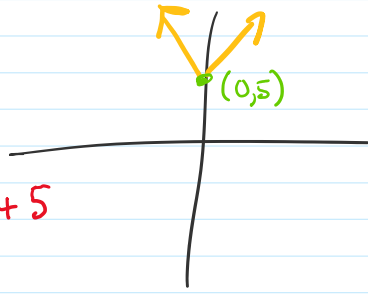
What does the graph of $f(x) = |x|$ look like?



What about $g(x) = |x| + 5$?

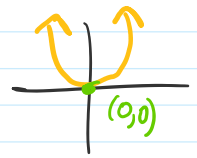
x	f(x)
-2	7
-1	6
0	5
1	6
2	7

$g(x) = f(x) + 5$

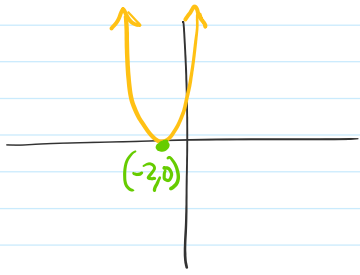


To shift the graph of $f(x)$ up by c , add c to $f(x)$.

What does the graph of $j(x) = x^2$ look like?



What does the graph of $k(x) = x^2 + 4x + 4$ look like?



x	k(x)
-3	1
-2	0
-1	1
0	4

(looks like $j(x) = x^2$, but shifted to the left by 2.)

To shift the graph of $j(x)$ to the right by c , replace x with $x - c$.

Why? $\rightarrow k(x) = x^2 + 4x + 4 = (x+2)^2 = j(x+2) = j(x - (-2))$.

How can we phrase this in terms of composite functions?

Let $t_5(x) = x + 5$. Then $g(x) = t_5(f(x)) = (t_5 \circ f)(x)$.

$t_2(x) = x + 2$. Then $k(x) = j(t_2(x)) = (j \circ t_2)(x)$.

t for "translate"

Practice: 1) Graph $f(x) = |x-5| - 3$

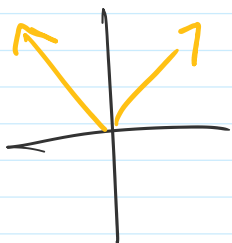
Practice: 1) Graph $f(x) = |x-5| - 3$

write equation →

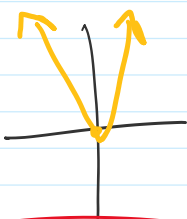
2) Translate $g(x) = x^2 - x + 1$ up by 1 and to the left by 3.

3) Translate $h(x) = 3$ to the right by 7.

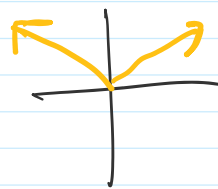
$$f(x) = |x|$$



$$g(x) = 2|x|$$



$$h(x) = |\frac{1}{2}x|$$



Scaling by c is called:

- stretch if $c > 1$
- compression if $c < 1$

$$g(x) = cf(x)$$

scales f vertically by c

$$h(x) = f\left(\frac{x}{c}\right)$$

scales f horizontally by c

Can we get g and h a different way?

$$\rightarrow g(x) = 2f(x) = f(2x)$$

$$h(x) = f\left(\frac{1}{2}x\right) = \frac{1}{2}f(x)$$

for $f(x) = |x|$, vertical scaling by c
= horizontal scaling by $\frac{1}{c}$

(Give an example of a function where this isn't true!)

Reflection

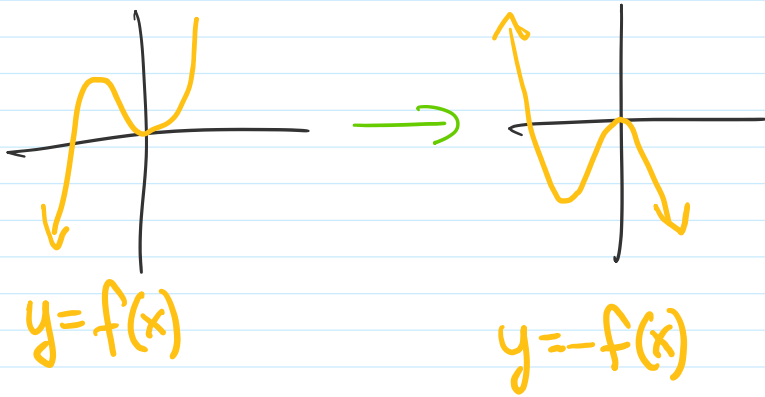
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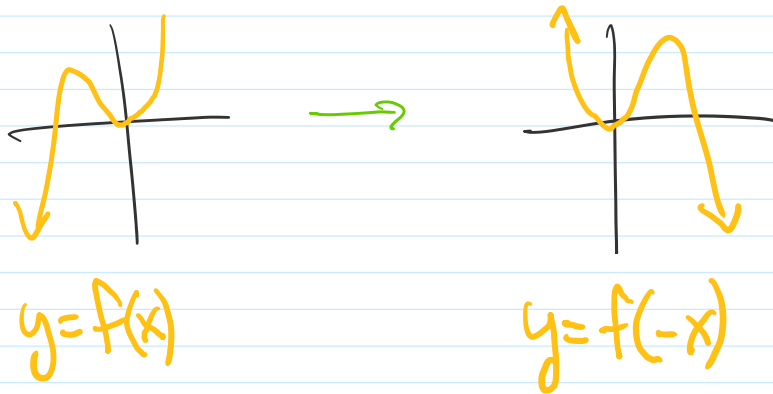
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Reflection



Vertical Scaling by -1
is vertical reflection.



Horizontal Scaling by -1
is horizontal reflection.

Summary

$f(x) + c$ \longrightarrow vertical shift by c

$f(x - c)$ \longrightarrow horizontal shift by c

$c f(x)$ \longrightarrow vertical scaling by c

$f\left(\frac{x}{c}\right)$ \longrightarrow horizontal scaling by c

$-f(x)$ \longrightarrow vertical reflection

$f(-x)$ \longrightarrow horizontal reflection

Graph $f(x) = 2\sqrt{-x-1} + 3$

Graph $f(x) = 2\sqrt{-x-1} + 3$

