

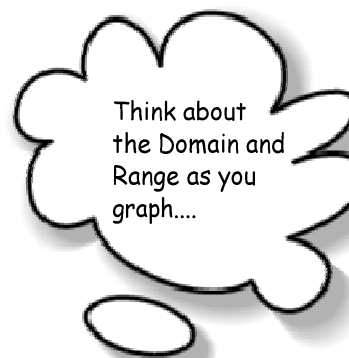
3.3 - Translations of Functions

Part A: Vertical Translations

Install / Open - Desmos on your phones (or just view [desmos.com](https://www.desmos.com))

a) $y = x^2$	BASE FUNCTION	
b) $y = x^2 + 5$	- graph moves	<u>UP 5 UNITS</u>
c) $y = x^2 - 3$	- graph moves	<u>DOWN 3 UNITS</u>

d) $y = \sqrt{x}$	BASE FUNCTION	
e) $y = \sqrt{x} + 4$	- graph moves	<u>UP 4</u>
f) $y = \sqrt{x} - 2$	- graph moves	<u>DOWN 2</u>



Try graphing the base function along with each of these:

g) $y = 1/x + 3$	Base Function:	<u>$\frac{1}{x}$</u>	- graph moves	<u>UP 3</u>
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h) $y = x^3 - 5$	Base Function:	<u>x^3</u>	- graph moves	<u>DOWN 5</u>
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You can graph a couple equations at a time so that you can more easily see the transformations from a base function.

General Result

If $y = f(x)$, then $y = f(x) + k$ represents a vertical translation

if $k > 0$ the graph of $y = f(x)$ moves UP k units

if $k < 0$ the graph of $y = f(x)$ moves DOWN k units

* Domain stays the same, range could change. No x value is affected, only y values. k is OUTSIDE of the FCN so no x values change.

Part B - Horizontal Translations

Graph the following using the Calculators and compare it to the base function.

1. Graph $y = x^2$, and the equations below to describe the transformations

a) $y = (x+4)^2$ - graph moves LEFT 4
b) $y = (x-2)^2$ - graph moves RIGHT 2

2. Graph $y = \sqrt{x}$, and the equations to describe the transformations

a) $y = \sqrt{x+1}$ - graph moves LEFT 1
b) $y = \sqrt{x-4}$ - graph moves RIGHT 4

General Result

If $y = f(x)$, then $y = f(x-h)$ represents a horizontal translation.

If $h > 0$, then the graph moves RIGHT h units

If $h < 0$, then the graph moves LEFT h units

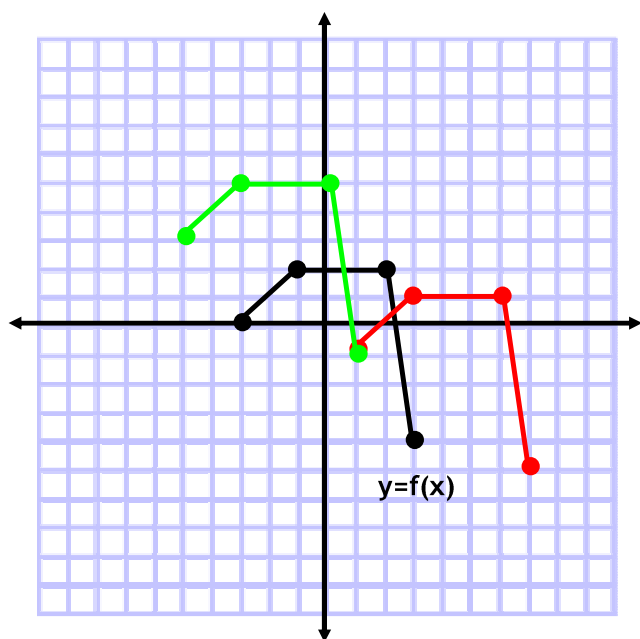
*OPPOSITE
what you think
since its inside the
FCN*

* Range stays the same, Domain could change. x values are affected, but not the y values. h is INSIDE the FCN so no y value changes.

Ex. Given the graph of $y=f(x)$, graph $y = f(x-4) - 1$ and $y = f(x+2)+3$

→ Right 4
→ Down 1

→ Left 2
→ UP 3



Practice

p. 189 #1bdfj, 2ef, 3dfgh, 4e, 5, 6f, 7bdf, 8bdf, 15, 16

