lulumath

Transformations of Functions I - Vertical Translations

Video Notes

Video Link

Transformations of Functions I - Vertical Translations

Background Knowledge:

- Parent Functions, Parts I and II

Consider some parent functions (including quadratic, square root, absolute value, reciprocal, and exponential) and determine what effect c has on $y = f(x) + c$, for c = 1, -3, 5, and -7.

Quadratic Functions:

Parent Function: $f(x) = x^2$

$y = f(x) + 1$: $y = x^2 + 1$

$y = f(x) - 3$: $y = x^2 - 3$

$y = f(x) + 5$: $y = x^2 + 5$

$y = f(x) - 7$: $y = x^2 - 7$

x	$f(x)$	$f(x)+1$	$f(x)-3$	$f(x)+5$	$f(x)-7$
-3	9	10	6	14	2
-2	4	5	1	9	-3
-1	1	2	-2	6	-6
0	0	1	-3	5	-7
1	1	2	-2	6	-6
2	4	5	1	9	-3
3	9	10	6	14	2

Square Root Function:

Parent Function: $f(x) = \sqrt{x}$

$y = f(x) + 1$: $y = \sqrt{x} + 1$

$y = f(x) - 3$: $y = \sqrt{x} - 3$

$y = f(x) + 5$: $y = \sqrt{x} + 5$

$y = f(x) - 7$: $y = \sqrt{x} - 7$

x	$f(x)$				
0	0	1	-3	5	-7
1	1	2	-2	6	-6
4	2	3	-1	7	-5
9	3	4	0	8	-4
16	4	5	1	9	-3
25	5	6	2	10	-2

Exponential Function:

Parent Function: $f(x) = 2^x$

$y = f(x) + 1$: $y = 2^x + 1$

$y = f(x) - 3$: $y = 2^x - 3$

$y = f(x) + 5$: $y = 2^x + 5$

$y = f(x) - 7$: $y = 2^x - 7$

Other families of functions:

- linear
- absolute value
- reciprocal

Summary:

$y = f(x) + c$

↳ vertical translation

$c > 0 \rightarrow$ up

$c < 0 \rightarrow$ down

* To determine the coordinates, add c to the OUTPUT of the original function (because it is a VERTICAL translation.).

OUTPUT ↑ y or $f(x)$

VERTICAL ↑ y or $f(x)$