

Transformation of Functions

This is a short lesson that goes over the basic transformations that you will encounter in Algebra 1.

Here are the basic transformations:

Using $y = x^2$

$y = (x - h)^2$ - The function moves h units to the RIGHT

$y = (x + h)^2$ - The function moves h units to the LEFT

$y = x^2 + k$ - The function moves UP k units

$y = x^2 - k$ - The function moves DOWN k units

$y = -x^2$ - The function REFLECTS over the X-AXIS

$y = (-x)^2$ - The function REFLECTS over the Y-AXIS

These are the basic transformations! Now let's practice a couple of examples!

Write $f(x)$ after it is shifted 5 units to the right.

$$f(x) = 3x$$

When shifting functions left or right, the shift occurs in PARENTHESES WITH X.

For instance, in this case:

$$f(x) = 3(x - 5)$$

Always remember to put parentheses (or | | for absolute value functions) around the LEFT/RIGHT transformation and x to signify a HORIZONTAL transformation.

Write $f(x)$ after it is reflected over the x-axis.

$$f(x) = \sqrt{x}$$

Remember for reflections over the X-AXIS, the negative sign goes on the OUTSIDE of the function. (If it was over the Y-AXIS, the negative sign would be INSIDE the function).

So, for this function:

$$f(x) = \sqrt{x}$$

For dilations, LARGER numbers on the outside make the function NARROWER and SMALLER numbers on the outside make the function WIDER.

Tips for Solving Problems:

1. When doing horizontal transformations, make sure to CREATE parentheses (or $| |$ for absolute value functions) with the LEFT/RIGHT shift and x . For vertical transformations, the UP/DOWN shift is included on the outside of the function.
2. For reflections over the y -axis, the negative sign for the reflection is INSIDE the function. For reflections over the x -axis, the negative sign for the reflection is OUTSIDE the function.
3. For dilations where a LARGER number is multiplied on the outside of the function (like $2x^2$), the function becomes more NARROW. For dilations where a SMALLER number is multiplied on the outside of the function (like $0.5x^2$), the function becomes WIDER