U3D8_T EX. 2(b) Combining Transformations

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U3D8_T EX. 2(b) Com...

U3D8

Example 2:

Given $f(x) = x^2 + 3$ $\quad y = -\frac{1}{2}f(2x+6) - 2$

b) What is the new "image equation"? $\quad 2(x+3)$

The image equation is the equation of the graph $f(x) = x^2 + 3$ with all the transformations applied to it.
(reflection in x-axis, V.C. $\frac{1}{2}$, H.C. 2, shift left 3, down 2 units).

$f(x) = x^2 + 3$

$y = -\frac{1}{2}f(2(x+3)) - 2$ ← step 1. If the coefficient of x inside the bracket is other than 1 then you must factor that number out of the bracket

The image equation is ← change $f(\_)$ to $(\_)^2+3$

$y = -\frac{1}{2}[(\quad)^2 + 3] - 2$

inside this bracket put $y = -\frac{1}{2}f(2(x+3)) - 2$

$y = -\frac{1}{2}[(2(x+3))^2 + 3] - 2$

This is the image equation

We can simplify this equation into one of our normal quadratic forms.
→ expand it out for $y = ax^2 + bx + c$ form

→ use algebraic skills for $y = a(x-h)^2 + k$ form

↳ $y = -\frac{1}{2}\left[(2)^2(x+3)^2 + 3\right] - 2$

$[2(x+3)]^2 = 2^2(x+3)^2$
power of a product rule

$y = -\frac{1}{2}\left[4(x+3)^2 + 3\right] - 2$

$a(b+c) = ab+ac$
distributive property

$y = -\frac{1}{2}(4)(x+3)^2 - \frac{1}{2}(3) - \frac{2}{1}$

$-\frac{1}{2}(3) = -\frac{3}{2}$, $-2 = \frac{-2}{1} = \frac{-4}{2}$

$y = -2(x+3)^2 - \frac{3}{2} - \frac{4}{2}$

$-\frac{3}{2} - \frac{4}{2} = -\frac{7}{2}$

$y = -2(x+3)^2 - \frac{7}{2}$

This is the simplified form of the image equation in vertex form.