Parent Functions and Transformations w/ examples

Following are systematic changes (transformations) that can be made to basic parent functions. Some of these affect *x*-values **before they are substituted** in the function, and these change the function in the *x*-direction. The *x*-direction transformations are

Shift left: $y = f(x+3)$ Shift right: $y = f(x-3)$

Compress to *y*-axis: $y = f(2x)$ Stretch from *y*-axis: $y = f(.5x)$

Flip or reflect left-to-right and right-to-left across the *y*-axis: $y = f(-x)$

Other transformations affect the *y*-values, **after the *x*-values had been substituted** in the function. These *y*-direction tranformations are

Shift up: $y = f(x)+3$ Shift down: $y = f(x)-4$

Stretch from *x*-axis: $y = 2f(x)$ Compress to *x*-axis: $y = .5f(x)$

Flip or reflect top-to-bottom and bottom-to-top over the *x*-axis: $y = -f(x)$

Examples using $y_1 = f(x) = 2^x = 2 \wedge x$ as the parent function.

$y_2 = f(x)-2 = 2^x - 2 = 2 \wedge x - 2$ 2 taken from _____ values. result:		$y_3 = f(x)+3 = 2^x + 3 = 2 \wedge x + 3$ 3 added to _____ values. result:
$y_4 = f(x-2) = 2^{x-2} = 2 \wedge (x-2)$ 2 taken from _____ values. result:		$y_5 = f(x+3) = 2^{x+3} = 2 \wedge (x+3)$ 3 added to _____ values. result:
$y_6 = -f(x) = -2^x = -2 \wedge x$ opposite of _____ values. result:		$y_7 = f(-x) = 2^{-x} = 2 \wedge (-x)$ opposite of _____ values. result:
$y_8 = f(3x) = 2^{3x} = 2 \wedge 3x$ multiplying _____ values. result:		$y_9 = 3f(x) = 3\ 2^x = 3\ 2 \wedge x$ multiplying _____ values. result: