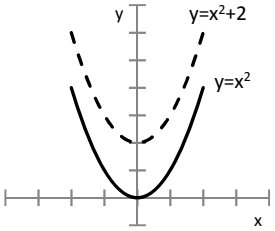
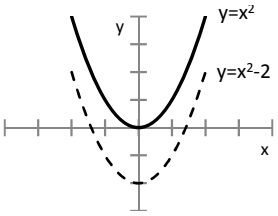
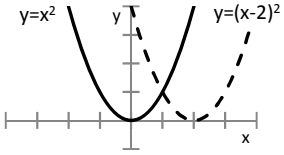
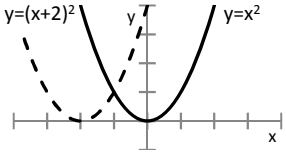
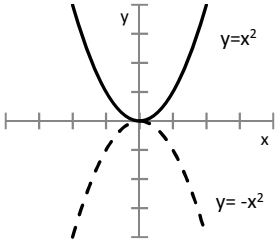
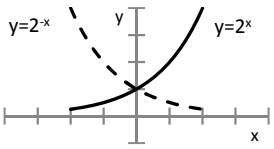
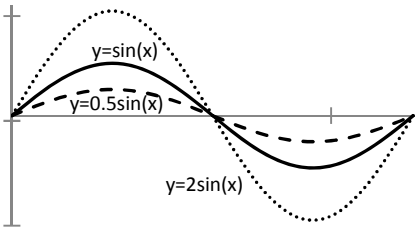
TRANSFORMATIONS OF FUNCTIONS

Assume the original function to be y = f(x) for all of the following transformations.

Operation	Effect on the graph of y=f(x)	Example
y = f(x) + c Add a positive constant to f(x)	vertical shift c units *upward*	
y = f(x) - c Subtract a positive constant from f(x)	vertical shift c units *downward*	
y = f(x-c) Replace x by x-c, where c is a positive constant	horizontal shift c units to the *right*	
y = f(x+c) Replace x by x+c, where c is a positive constant	horizontal shift c units to the *left*	
y = -f(x) Multiply f(x) by -1	relection about the x-axis	
y = f(-x) Replace x by -x	relection about the y-axis	
y = c f(x) Multiply f(x) by a positive constant	vertical stretch, for c > 1 vertical shrink, for 0 < c < 1	
y = f(cx) Replace x by cx, where c is a positive constant	horizontal shrink, for c > 1 horizontal stretch, for 0 < c < 1