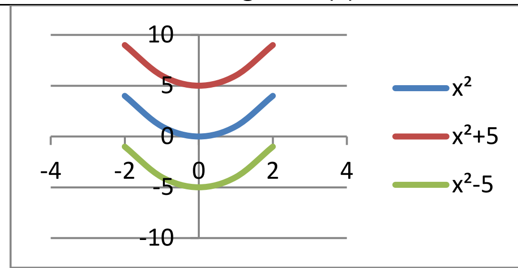
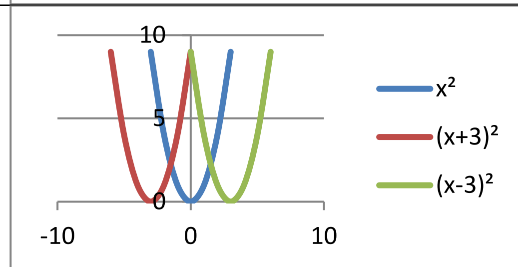
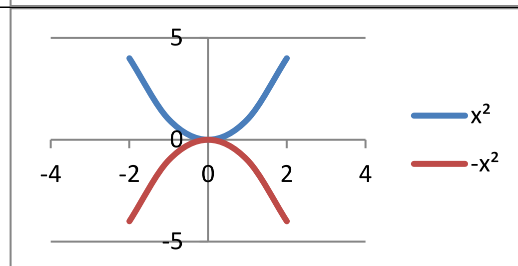
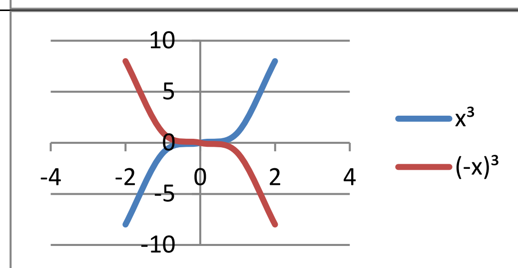
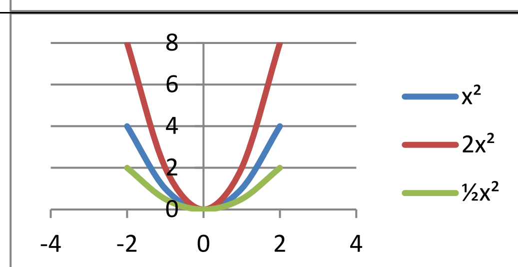
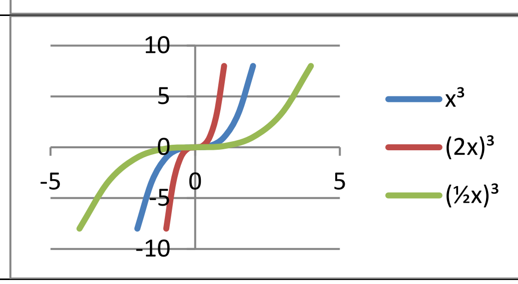
Summary of Transformations

Graph	Draw the graph of f(x) and:	Changes in f(x)
Vertical shift $y = f(x) + c$ $y = f(x) - c$	Raise the graph of f(x) by c units -add c to y coordinate Lower the graph of f(x) by c units -subtract c from y coordinate	
Horizontal shift $y = f(x + c)$ $y = f(x - c)$	Shift the graph f(x) to the left c units -subtract c from x coordinate Shift the graph f(x) to the right c units -add c to x coordinate	
Reflection about the x-axis $y = -f(x)$	Reflect the graph of f(x) about the x-axis -multiply each y coordinate by -1	
Reflection about the y-axis $y = f(-x)$	Reflect the graph of f(x) about the y-axis -multiply each x coordinate by -1	
Vertical stretching and compression $y = cf(x), c > 1$ $y = cf(x), 0 < c < 1$	Vertically stretching the graph of f(x) $(c > 1)$ Vertically compressing the graph of f(x) $(0 < c < 1)$ -multiply each y coordinate by c	
Horizontal stretching and compression $y = f(cx), c > 1$ $y = f(cx), 0 < c < 1$	Horizontally compressing the graph of f(x) $(c > 1)$ Horizontally stretching the graph of f(x) $(0 < c < 1)$ -divide each x coordinate by c	
$y = \frac{1}{f(x)}$	Take the reciprocal of each y coordinate of f(x)	

Order of operations for transformations: 1) horizontal shifts 2) stretches/compressions 3) reflections 4) vertical shifts