1 **Extra credit.** *Suppose that 3 is an x-intercept of the graph of $y = f(x)$; so in other words, $(3, 0)$ is an intercept of that graph. For each of the following equations, state what must be an x-intercept of its graph.*

a $y = f(x - 2)$

Since $(3, 0)$ is on the original graph, $0 = f(3)$. Now, $3 = x - 2$ if $x = 5$, so $0 = f(5 - 2)$. Therefore,

$$(5, 0)$$

must be on this graph.

b $y = 4f(x)$

Since $(3, 0)$ is on the original graph, $0 = f(3)$. Multiplying both sides by 4, $0 = 4f(3)$. Therefore,

$$(3, 0)$$

must be on this graph too.

2 *On the number plane below, draw the graphs of these two equations. (Be sure to label which is which.)*

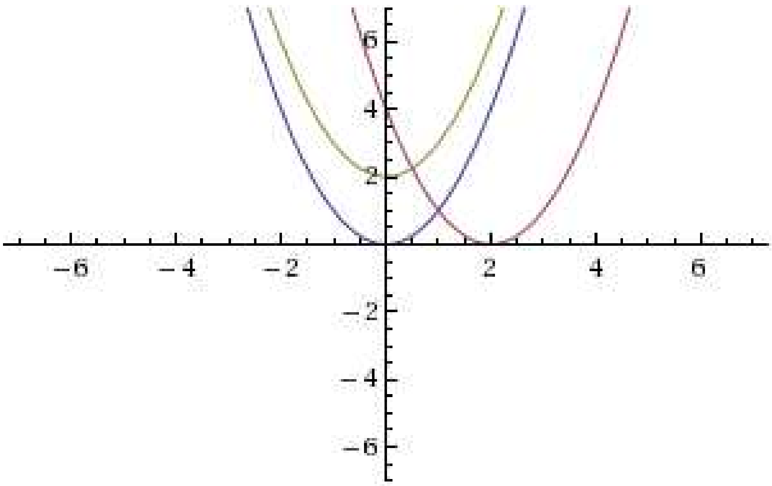
You should be familiar with the graph of $y = x^2$; the key points are $(0, 0)$, $(1, 1)$, $(-1, 1)$, $(2, 4)$, and $(-2, 4)$. (The graph appears below in blue.) The other graphs are linear coordinate transformations of this one.

a $y = (x - 2)^2$

This graph is shifted to the right by 2; in other words, add 2 to the first coordinate of each point. The key points become $(2, 0)$, $(3, 1)$, $(1, 1)$, $(4, 4)$, and $(0, 4)$. The graph appears below in purple.

b $y = x^2 + 2$

This is shifted up by 2; in other words, add 2 to the second coordinate of each point. The key points become $(0, 2)$, $(1, 3)$, $(-1, 3)$, $(2, 6)$, and $(-2, 6)$. The graph appears below in brown.



(These graphs were produced by Wolfram Alpha.)