**The Ups and Downs of Quadratics**

Your task in this activity is to explore how the graph of a quadratic function is related to its coefficients. The specific questions here provide a framework for that exploration.

1. Explain how you can tell by looking at the coefficients of a quadratic function whether the vertex of the graph is a minimum or a maximum.

For Questions 2 through 4, begin by graphing the quadratic function defined by the equation   
*y* = *x*2 + 5*x* + 3. Adjust the viewing window of your graphing calculator so you get a good view of the graph.

You will be trying to create new functions whose graphs vary from this one in specific ways. You should do this simply by changing the coefficients, without changing the viewing window. As you graph new functions, you should leave the graph of the original function on the screen for comparison.

1. Try to create a new function whose graph is your original graph moved up or down. That is, the graph of the new function should have exactly the same shape as the original one, but the new vertex should be higher or lower on the screen. Describe your efforts and the results you get. Be sure to record the function you find and sketch its graph.
2. Try to create a new function whose graph is your original graph moved left or right. That is, the graph of the new function should have exactly the same shape as the original one, but the new vertex should be to the left or to the right on the screen. Describe your efforts and the results you get, and record the function and its graph.
3. Try to create a new function that has the same vertex as your original graph but whose graph is “wider” or “narrower.” Describe your efforts and the results you get, and record the function and its graph.