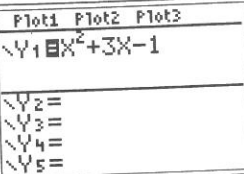
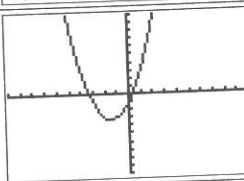

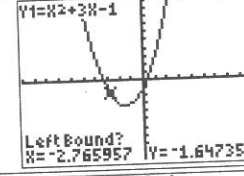
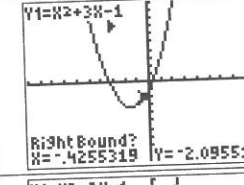
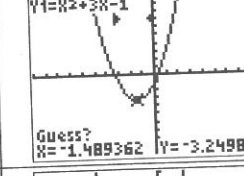


### Using the Graphing Calculator to Determine the Vertex

We already know how to graph a function and find the intercepts using the calculator. We also need to know how to determine the vertex. The following example shows how to use the calculator to find the vertex of a quadratic function.

#### Example 4:

Determine the vertex of  $y = x^2 + 3x - 1$

Instructions	What you should see
Enter the equation and press GRAPH.	
Note whether the parabola opens <i>up</i> or <i>down</i> . (This one opens <i>up</i> .)	
Use 2 <sup>nd</sup> TRACE to access the CALC menu.	
<p>If the parabola opens upward, choose <b>3: minimum</b>                      If the parabola opens downward, choose <b>4: maximum</b></p>	
Notice that your screen asks: Left Bound? A message like this indicates that you should move your cursor to the LEFT side of the vertex of the parabola. Once you have moved the cursor anywhere to the left of the vertex you can press ENTER.	
The next screen asks: Right Bound? Move your cursor to the RIGHT of the vertex and press ENTER.	
The final question asks: Guess? Move your cursor <i>close</i> to the vertex and press ENTER.	
<p><b>Conclusion:</b>                      The vertex is <math>(-1.5, -3.25)</math>.                      We also say that the <i>minimum</i> value of <math>-3.25</math> occurs when <math>x = -1.5</math>.</p>	