

## Lesson 12-2

## Example 1

Graph  $y = 3x^2 - 5x - 2$  on a graphing calculator. Estimate the coordinates of the vertex.

## Solution

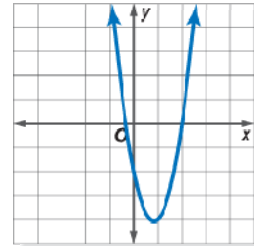
Enter the equation. Graph the function. Use the trace and zoom features to locate the coordinates of the vertex.

The closer you zoom in, the closer the coordinates will be to the actual values of  $x$  and  $y$ . Eventually, you may be able to see a relationship between the decimal values on the screen and a common fraction or whole number. For example, you may have arrived at the coordinates  $x = 0.8333333$  and  $y = -4.0833333$ .

$0.8333333$  is about  $\frac{5}{6}$ .

$-4.0833333$  is about  $-4\frac{1}{12}$ .

The vertex is approximately  $1\frac{5}{6}, -4\frac{1}{12}$ .



**Example 2**

Find the coordinates of the vertex for the graph of  $y = -2x^2 + 5x - 3$ .

**Solution**

$$x = -\frac{b}{2a}$$

$$x = -1 \frac{5}{2(-2)^2} \quad \text{Substitute for } a \text{ and } b.$$

$$x = \frac{5}{4} \quad \text{Simplify.}$$

$$y = -2\left(\frac{5}{4}\right)^2 + 5\left(\frac{5}{4}\right) - 3$$

$$y = -2 \frac{25}{16} + \frac{25}{4} - 3$$

$$y = \frac{1}{8}$$

The coordinates of the vertex for the graph  $y = -2x^2 + 5x - 3$  are  $1\frac{5}{4}, \frac{1}{8}$ .

**Example 3**

Graph  $f(x) = -2x^2 + 2x - 1$ .

**Solution**

Locate the vertex.

$$x = -\frac{b}{2a} = -1 \frac{2}{2(-2)} = \frac{1}{2}$$

$$y = -2\left(\frac{1}{2}\right)^2 + 2\left(\frac{1}{2}\right) - 1$$

$$y = -\frac{1}{2} + 1 - 1$$

$$y = -\frac{1}{2}$$

The vertex is  $\frac{1}{2}, -\frac{1}{2}$ . The axis of symmetry is  $x = \frac{1}{2}$ .

Because  $a$  is less than 0, the parabola opens downward. Substitute values in the equation to locate a few points.

<b>x</b>	-1	0	1
<b>y</b>	-5	-1	-1

Use the axis of symmetry to visually locate other points. Draw a smooth curve.

