Name _____ Period _____ Date _____

Use the Vertex Formula

Consider the graph of $y = -3x^2 - 6x + 4$.

a. Write the equation of the axis of symmetry.

In $y = -3x^2 - 6x + 4$, $a = -3$ and $b = -6$.

$x = -\frac{b}{2a}$ Equation for the axis of symmetry of a parabola

$x = -\frac{-6}{2(-3)}$ or -1 $a = -3$ and $b = -6$

The equation of the axis of symmetry is $x = -1$.

b. Find the coordinates of the vertex.

Since the equation of the axis of symmetry is $x = -1$ and the vertex lies on the axis, the x-coordinate for the vertex is -1.

$y = -3x^2 - 6x + 4$ Original equation

$y = -3(-1)^2 - 6(-1) + 4$ $x = -1$

$y = -3 + 6 + 4$ Simplify.

$y = 7$ Add.

The vertex is at $(-1, 7)$.

c. Identify the vertex as a maximum or minimum.

Since the coefficient of the x^2 term is negative, the parabola opens downward and the vertex is a maximum point.

d. Graph the function.

You can use the symmetry of the parabola to help you draw its graph. On a coordinate plane, graph the vertex and the axis of symmetry. Choose a value for x other than -1. For example, choose 1 and find the y-coordinate that satisfies the equation.

$y = -3x^2 - 6x + 4$ Original equation

$y = -3(1)^2 - 6(1) + 4$ Let $x = 1$.

$y = -5$ Simplify.

Graph $(1, -5)$. Since the graph is symmetrical about its axis of symmetry $x = -1$, you can find another point on the other side of the axis of symmetry. The point at $(1, -5)$ is 2 units to the right of the axis. Go 2 units to the left of the axis and plot the point $(-3, -5)$. Repeat this for several other points. Then sketch the parabola.