M117 SECTION 11.6 FURTHER GRAPHING OF QUADRATIC FUNCTIONS

This time the equation will be presented in the form: $f(x) = ax^2 + bx + c$
That is, **NO VISUAL TRANSFORMATIONS**

So far, each quadratic equation was presented so that the transfromations with respect to the vertex and opening direction were found by inspection. Then we found a few points to help us graph the parabola. However, quadratic equations are generally presented in the $f(x) = ax^2 + bx + c$ format. All transformations are now hidden within the equation and are not visually apparent as they were before.

To graph quadratics in this form we still need to find the key characteristics:
a. the end behavior (opens up/down)
b. the vertex
c. the axis of symmetry

and some new ones to help in graphing
d. the y-intercept
e. the x-intercept(s) if any

EXAMPLE $f(x) = x^2 + 6x + 8$

a. The end behavior (opens up/down)

How? ***Examine the coefficent of the square term***

b. The vertex

How? ***Formula:*** $\left(\frac{-b}{2a}, f\left(\frac{-b}{2a}\right)\right)$

First, find the x-coordinate or the vertex using $\frac{-b}{2a}$

Then, to find the y-coordinate, plug the x-coordinate (from above) back into the equation and solve for y.

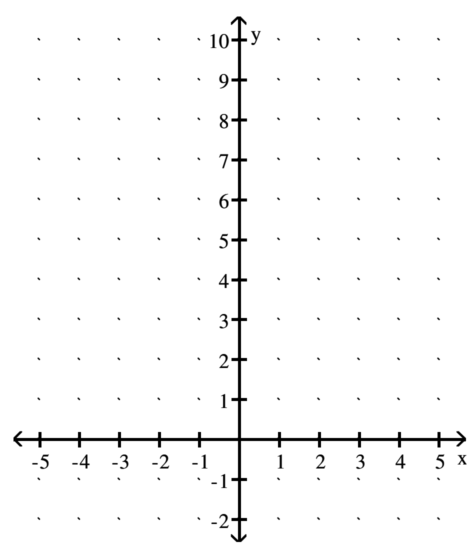
c. The axis of symmetry

d. The y-intercept

How? Let x = 0 and solve for y.

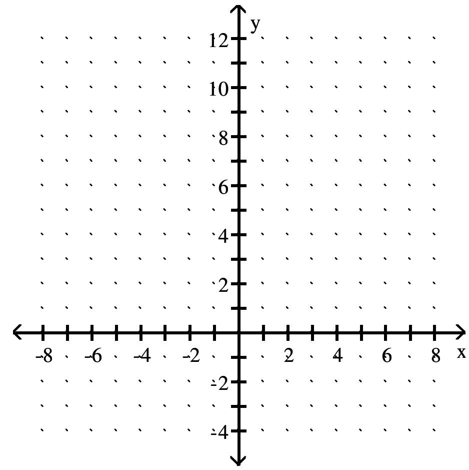
e. The x-intercept(s) if any

How? Let y = 0 and solve for x.
Use factoring, square rooting, or the quadratic formula.

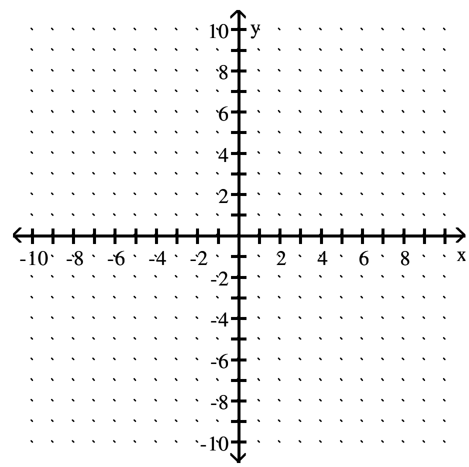


f. Graph.

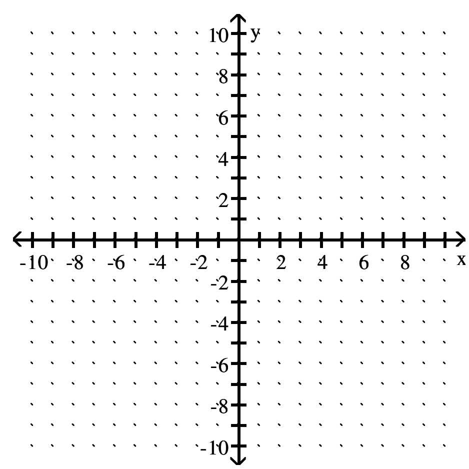
EXAMPLE $f(x) = x^2 - 3x + 1$



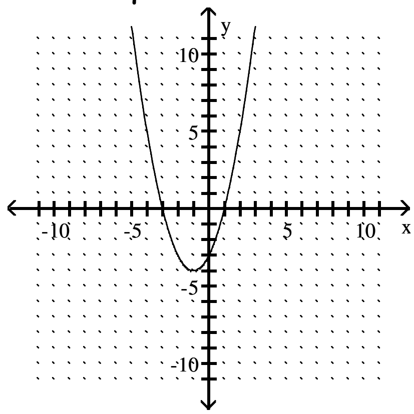
EXAMPLE $f(x) = 2x^2 + 8x + 9$



EXAMPLE $f(x) = -x^2 - 6x - 8$



Choose the equation that matches the graph.

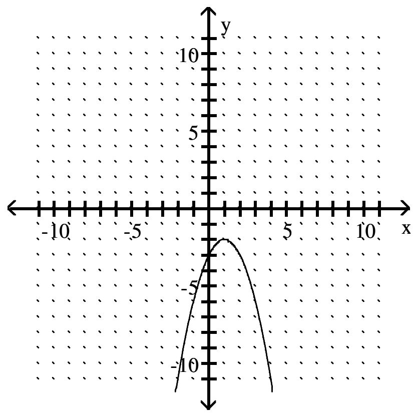


a) $f(x) = -x^2 + 2x - 3$

b) $f(x) = x^2 + 2x - 3$

c) $f(x) = x^2 - 2x - 3$

d) $f(x) = x^2 + 2x + 3$



a) $f(x) = -x^2 - 2x - 3$

b) $f(x) = x^2 - 2x - 3$

c) $f(x) = x^2 + 2x + 3$

d) $f(x) = -x^2 + 2x - 3$

An arrow is fired into the air with an initial velocity of 64 feet per second. The height in feet of the arrow t seconds after it was shot into the air is given by the function $h(t) = -16t^2 + 64t$. Find the maximum height of the arrow.

The cost in millions of dollars for a company to manufacture x thousand automobiles is given by the function $C(x) = 4x^2 - 16x + 32$. Find the number of automobiles that must be produced to minimize the cost.