Step 2 Identify the axis of symmetry and extrema based on the equation in vertex form. The vertex is at (h, k) or $(3, 4)$. Since there is a negative sign before the x^2-term, the parabola opens down and has a maximum at $(3, 4)$. The equation of the axis of symmetry is $x = 3$.

Step 3 Solve for x to find the zeros.

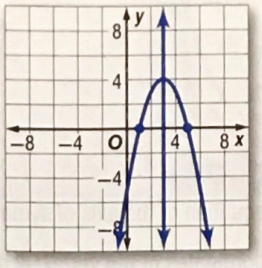
$0 = -(x - 3)^2 + 4$ Vertex form, $y = 0$

$(x - 3)^2 = 4$ Add $(x - 3)^2$ to each side.

$x - 3 = \pm 2$ Take the square root of each side.

$x = 5$ or 1 Add 3 to each.

Step 4 Use the key features to graph the function.



Analyze the Results

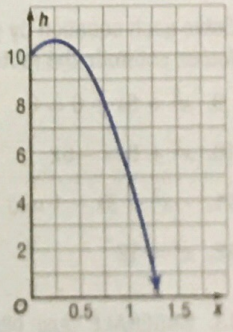
1. Why do you need to complete the square to write the equation of a quadratic function in vertex form?

Write each function in vertex form. Identify the axis of symmetry, extrema, and zeros. Then graph the function.

2. $y = x^2 + 6x$
3. $y = x^2 - 8x + 6$
4. $y = x^2 + 2x - 12$
5. $y = x^2 + 6x + 8$
6. $y = x^2 - 4x + 3$
7. $y = x^2 - 2.4x - 2.2$
8. $y = -4x^2 + 16x - 11$
9. $y = 3x^2 - 12x + 5$
10. $y = -x^2 + 6x - 5$

Activity 3 Use Extrema in the Real World

DIVING **Alexis jumps from a diving platform upward and outward before diving into the pool. The function $h = -9.8t^2 + 4.9t + 10$, where h is the height of the diver in meters above the pool after t seconds approximates Alexis's dive. Graph the function, then find the maximum height that she reaches and the equation of the axis of symmetry.**



Step 1 Graph the function.

Step 2 Complete the square to write the eqution of the function in vertex form.

$h = -9.8t^2 + 4.9t + 10$

$h = -9.8(t - 0.25)^2 + 10.6125$

Step 3 The vertex is at (0.25, 10.6125), so the maximum height is 10.6125 meters. The equation of the axis of symmetry is $x = 0.25$.

Exercise

11. **SOFTBALL** Jenna throws a ball in the air. The function $h = -16t^2 + 40t + 5$, where h is the height in feet and t represents the time in seconds, approximates Jenna's throw. Graph the function, then find the maximum height of the ball and the equation of the axis of symmetry. When does the ball hit the ground?