

Applications of the Vertex

Words that Indicate Finding Vertex

- Minimum/Maximum
- Minimize/Maximize
- Least/Greatest
- Smallest/Largest



Quadratic Equations

Standard Form:  $y = ax^2 + bx + c$       y-int:  $(0, c)$   
 Vertex Form:  $y = a(x - h)^2 + k$       vertex:  $(h, k)$   
 Intercept Form:  $y = a(x - p)(x - q)$       x-int:  $(p, 0)$  &  $(q, 0)$

Suppose the flight of a launched bottle rocket can be modeled by the equation  $y = -x^2 + 6x$ , where  $y$  measures the rocket's height above the ground in feet and  $x$  represents the number of seconds that have passed since the rocket was fired.

Standard Form  $Ax^2 + Bx + C$

a. Graph the quadratic equation  $y = -x^2 + 6x$  and label its axes accordingly.

$a = -1$     $b = 6$     $c = 0$

Opens Up or Down DOWN

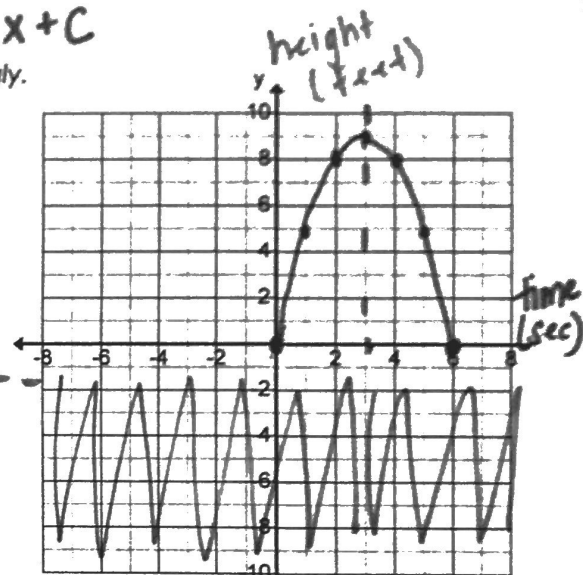
Axis of symmetry  $x = 3$

Vertex  $(3, 9)$

y-intercept  $(0, c) \rightarrow (0, 0)$

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

x	f(x) = y
1	$f(1) = -(1)^2 + 6(1) = 5$
2	$f(2) = -(2)^2 + 6(2) = 8$
3	9
4	8
5	5



Vertex:  $(x, f(x)) \rightarrow (3, f(3))$

a. What coordinate point shows the maximum height of the rocket?

vertex:  $(3, 9)$

$f(3) = -(3)^2 + 6(3)$

$y = f(3) = 9$

b. What is the maximum height in feet that the bottle rocket reaches?

y value of vertex: 9 feet

c. How long did it take for the bottle rocket to reach in maximum height (in seconds)?

x-value of vertex: 3 seconds

How long does it take the rocket to hit the ground?

$x = 0$       6 seconds