

Objective – Students will quickly find the vertex of a parabola by using a formula.

Finding the Vertex of Quadratic Equations

The vertex (x, y) of an equation in the form $y = ax^2 + bx + c$ can be found by letting $x = \frac{-b}{2a}$, and y will be whatever you get when you plug x into the equation.

Example: $y = 3x^2 + 12x - 5$

1. Find the x-coordinate of the vertex.

$$1. \quad a = 3 \text{ and } b = 12$$

$$\text{so, } \frac{-b}{2a} \text{ would be } \frac{-12}{2(3)} = \frac{-12}{6} = -2$$

2. Plug the x-coordinate into the equation to find y .

$$2. \quad y = 3(-2)^2 + 12(-2) - 5$$

$$y = 3(4) + 12(-2) - 5$$

$$y = 12 - 24 - 5 = -17$$

Therefore, the vertex is $(-2, -17)$

Practice: Find the vertex of the parabolas given by the equations below.

$$1. \quad y = 3x^2 - 24x - 7$$

$$2. \quad y = x^2 + 6x + 3$$

$$3. \quad y = -2x^2 - 8x + 10$$

$$4. \quad y = 2x^2 - 16x + 1$$

$$5. \quad y = 3x^2 - 24x - 15$$

$$6. \quad y = -x^2 + 5x + 1$$

$$7. \quad y = -4x^2 + 8x - 1$$

$$8. \quad y = 6x^2 + 12x + 6$$

$$9. \quad y = 2x^2 - 2x + 5$$

10. A ball is dropped kicked with a velocity of 64 ft/sec from 2 feet off the ground. $f(t) = -16t^2 + 64t + 2$

a. What is the maximum height of the ball?



b. How long does it take for the ball to reach the maximum height?

c. How high will the ball be after 1 second?

11. You are standing on your deck which is 4 feet off of the ground; from the deck you launch a Stomp Rocket. The height h (in feet) of the rocket after t seconds is given by the equation: $h = -16t^2 + 112t + 4$.

a. What is the maximum height that the rocket will reach?

b. How long does it take for the rocket to reach the maximum height?

c. How high will the rocket be after 5 seconds?