

Chapter 2

Quadratic Functions

1. Transformations of Quadratic Functions
2. Characteristics of Quadratic Functions
3. Focus of a Parabola
4. **Modeling with Quadratic Functions**



2.4 - Modeling with Quadratic Functions

1 of 10

Warmup - Find the equation for the following.

1) Focus (0, 2); directrix $x = 2$

$$1) x = -\frac{1}{4}(y - 2)^2 + 1$$

2) Focus (-2, 0); directrix $y = 2$

$$2) y = -\frac{1}{4}(x + 2)^2 + 1$$

3) Focus (3, 4); vertex (3, 2)

$$3) y = \frac{1}{8}(x - 3)^2 + 2$$

4) Focus (-2, 1); vertex (-3, 1)

$$4) x = \frac{1}{4}(y - 1)^2 - 3$$

2.4 - Modeling with Quadratic Functions

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Standard Form

$$y = ax^2 + bx + c$$

Opens vertically

Vertex Form

$$y = a(x - h)^2 + k$$

Intercept Form

$$y = a(x - p)(x - q)$$

Focus, Directrix Form

$$y = \frac{1}{4p}(x - h)^2 + k$$

Opens horizontally

$$x = a(y - k)^2 + h$$

$$x = a(y - p)(y - q)$$

2.4 - Modeling with Quadratic Functions

Find the equation:

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The point on a parabola is (2, 1) and the vertex is (3, -2).

Opens vertically.

$$y = 3(x - 3)^2 - 2$$

2.4 - Modeling with Quadratic Functions

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Find the equation:

1) The point on a parabola is (3, -1) and the vertex is (-1, -2).

Opens horizontally.

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

2) The point on a parabola is (3, 3) and the vertex is (-1, 4).

Opens vertically.

$$y = -\frac{1}{16}(x + 1)^2 + 4$$

2.4 - Modeling with Quadratic Functions

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Find the equation: parabola has x-intercepts are 4 and -3 and passes through point (-2, 3). **Opens vertically.**

$$y = -\frac{1}{2}(x - 4)(x + 3)$$

2.4 - Modeling with Quadratic Functions

Practice - Find the equation:

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1) Parabola has x-intercepts of 6 and -1 and passes through point (-2, 5).

$$y = \frac{5}{8}(x - 6)(x + 1)$$

2) Parabola has y-intercepts 6 and -1 and passes through point (-2, 7).

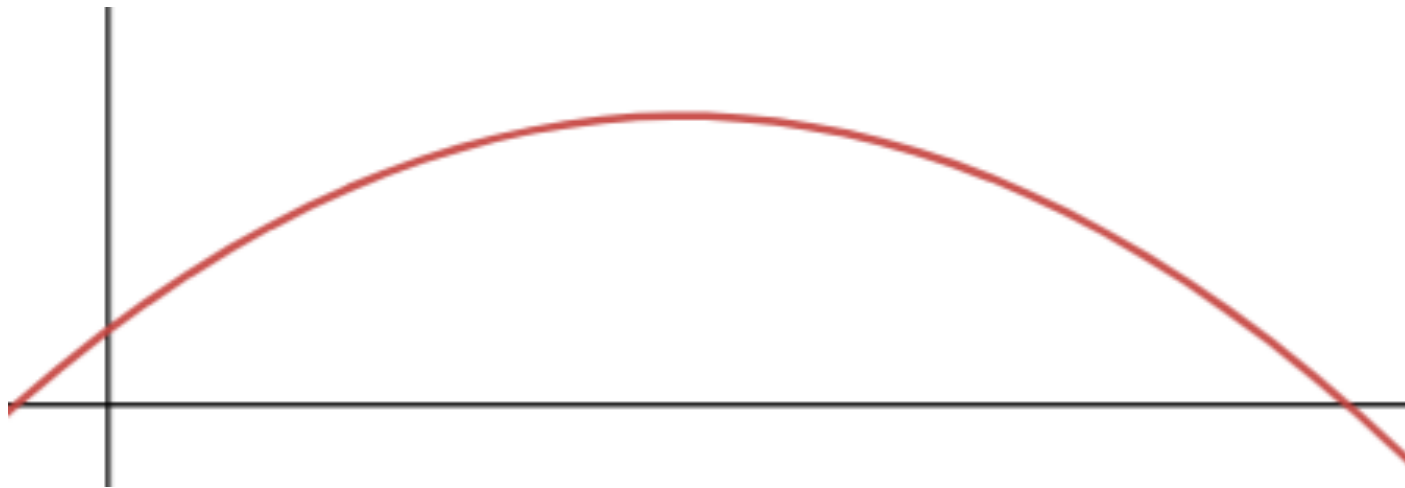
$$x = -\frac{1}{4}(y - 6)(y + 1)$$

2.4 - Modeling with Quadratic Functions

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Mr Greenstein throws a ball and it is modeled by the equation

$$h(t) = -16t^2 + 40t + 1.5$$



1) How many seconds before it reaches its peak?

$$t = -\frac{b}{2a} = 1.25 \text{ sec}$$

2) How long before it reaches the ground?

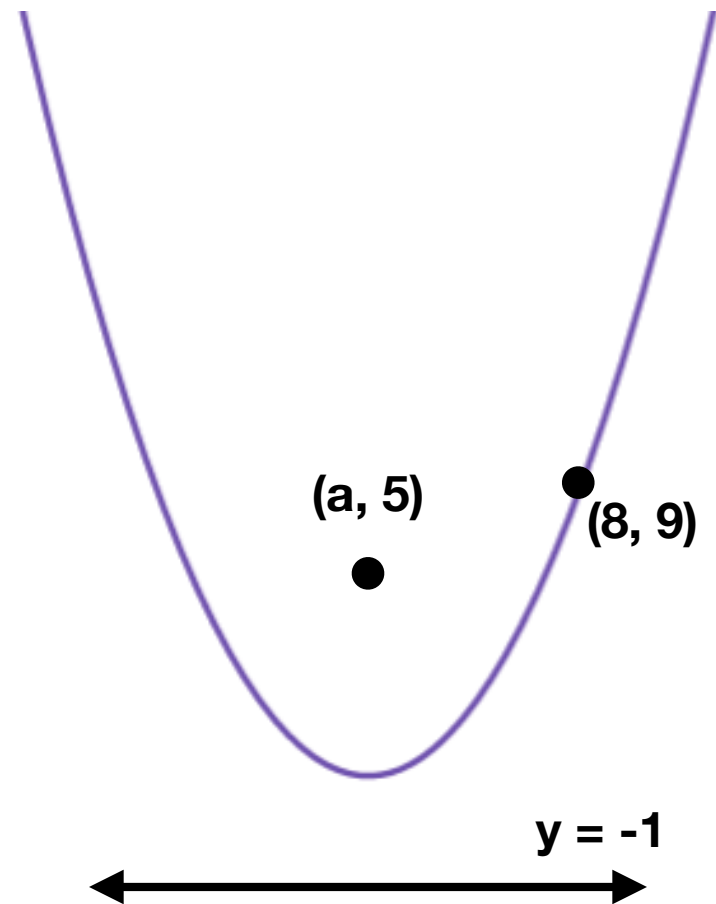
$$t = -0.037, 2.54 \text{ sec}$$

2.4 - Modeling with Quadratic Functions

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Focus $(a, 5)$; Point on Parabola $(8, 9)$; Directrix $y = -1$
Find a , the Vertex and the equation.

$$y = \frac{1}{12}(x + 1.165)^2 + 2$$



2.4 - Modeling with Quadratic Functions

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Given the following information, find b . $y = 2x^2 + 4x + b$

Directrix $y = 3$

$$y - b = 2(x^2 + 2x)$$

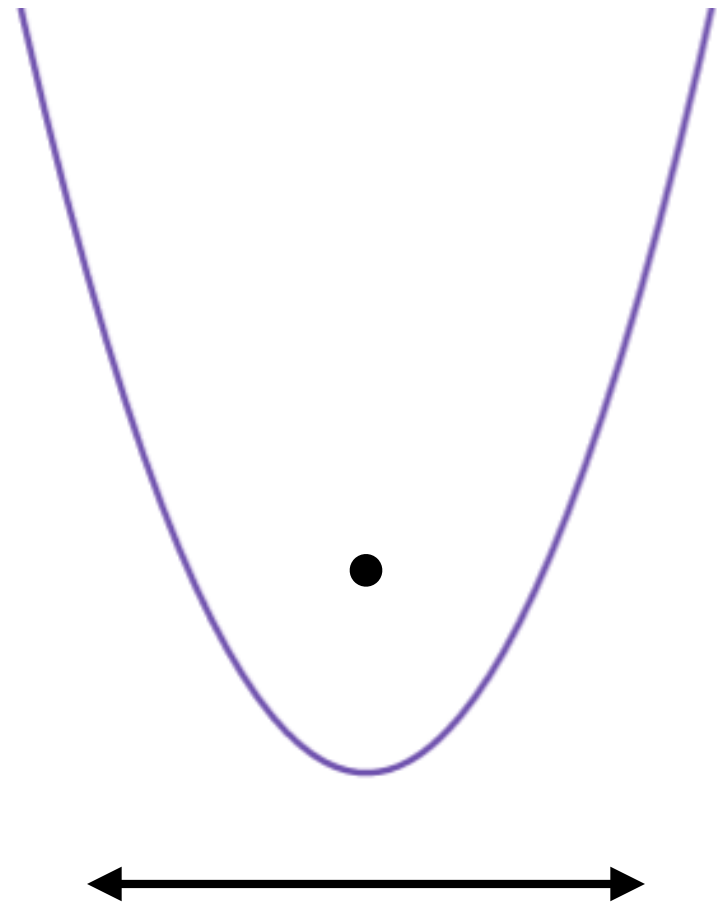
$$y - b + 2 = 2(x + 1)^2$$

$$\frac{1}{4p} = 2$$

$$p = \frac{1}{8} \quad V(-1, 3\frac{1}{8})$$

$$b - 2 = 3\frac{1}{8}$$

$$y = 2x^2 + 4x + \frac{41}{8}$$



2.4 - Modeling with Quadratic Functions

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Find the directrix.

$$D : x \approx 4.09$$

