

ALG I - §9-2 NOTES

Algebra I

9.2 Quadratic Functions

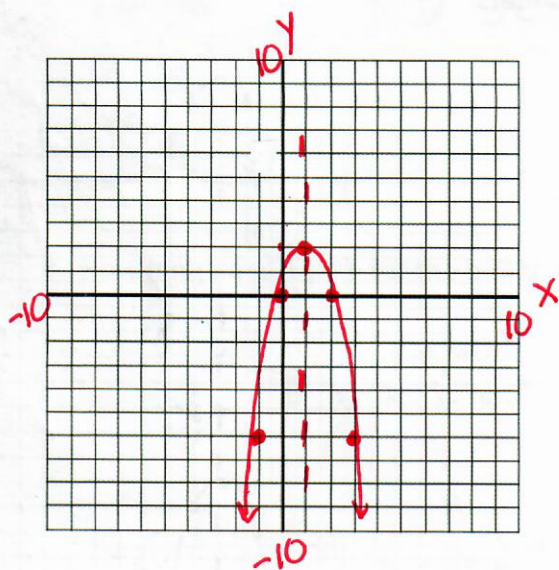
Objective: To graph quadratic functions in the form $y = ax^2 + bx + c$

WARM-UP Graph $y = -2x^2 + 4x$

$a = -2$ $b = 4$ $c = 0$

$$\frac{-b}{2a} = \frac{-4}{2(-2)} = 1$$

x	$y = -2x^2 + 4x$	y
-1	$-2(-1)^2 + 4(-1) = -2(1) - 4 = -2 - 4$	-6
0	$-2(0)^2 + 4(0) = -2(0) - 0 = 0$	0
1	$-2(1)^2 + 4(1) = -2(1) + 4 = -2 + 4$	2
2	$-2(2)^2 + 4(2) = -2(4) + 8 = -8 + 8$	0
3	$-2(3)^2 + 4(3) = -2(9) + 12 = -18 + 12$	-6



Vertex: $(1, 2)$

Open up/down: down

Max/Min: Max

Axis of Symmetry*: $x = 1$

Domain: All \mathbb{R}

Range: All $\mathbb{R} \leq 2$

NOTE: The axis of symmetry is in the equation $y = ax^2 + bx + c$ is: $x = \frac{-b}{2a}$

Example 1 Graph $y = x^2 - 6x + 4$ without using a table.

$a = 1$, $b = -6$, $c = 4$

Axis of Symmetry: $x = \frac{-b}{2a}$

$$x = \frac{6}{2(1)}$$

$$x = 3$$

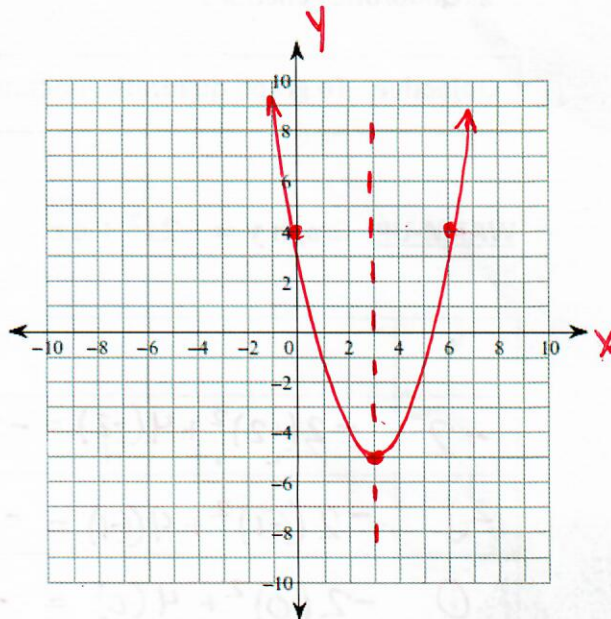
Vertex: $y = (3)^2 - 6(3) + 4 = (3, -5)$

$$y = 9 - 18 + 4$$

$$y = -9 + 4$$

$$y = -5$$

y-intercept: $(0, c) = (0, 4)$



Example 2 Graph $y = -x^2 + 2x - 5$ without using a table.

$a = -1$, $b = 2$, $c = -5$

Axis of Symmetry: $x = \frac{-b}{2a}$

$$x = \frac{-2}{2(-1)}$$

$$x = \frac{-2}{-2}$$

$$x = 1$$

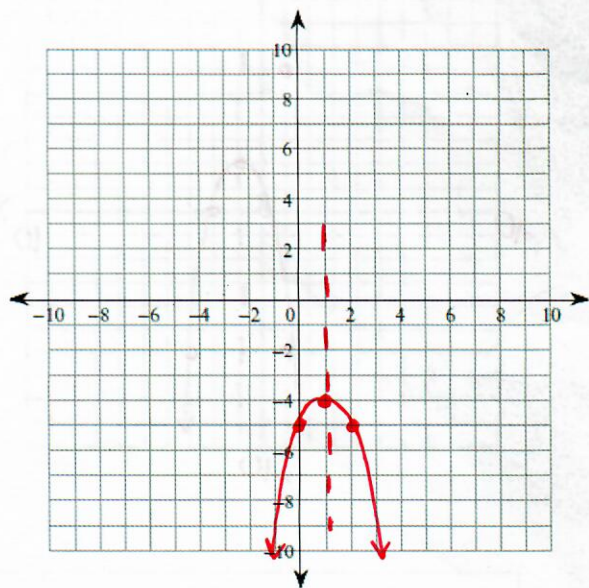
Vertex:

$$y = -(1)^2 + 2(1) - 5 = (1, -4)$$

$$y = -1 + 2 - 5$$

$$y = -4$$

y-intercept: $(0, c) = (0, -5)$



Example 3

A baseball player hit a ball with an upward velocity of 64 feet/sec. Its height h in feet after t seconds is given by the function $h(t) = -16t^2 + 64t + 6$.

$$a = -16, b = 64, c = 6$$

a. What is the maximum height the ball reaches?

$$x = \frac{-b}{2a}$$

$$x = \frac{-64}{2(-16)}$$

$$x = \frac{-64}{-32}$$

$$x = 2$$

$$h(2) = -16(2)^2 + 64(2) + 6$$

$$= -16(4) + 128 + 6$$

$$= -64 + 128 + 6$$

$$= 64 + 6$$

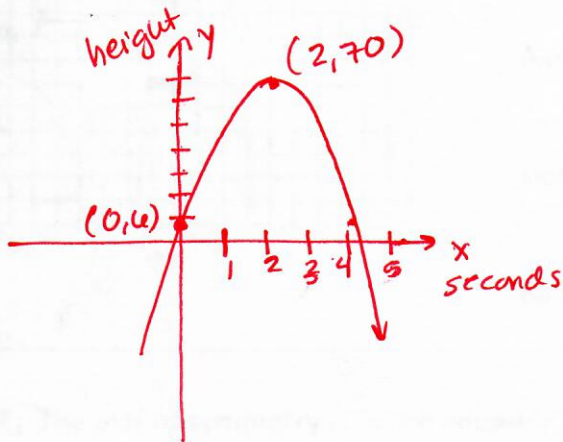
$$= 70$$

Maximum height is 70 ft.

b. How long will it take the baseball to reach the maximum height?

2 seconds

c. How long does it take for the ball to hit the ground?



Between 4 & 5 seconds.