

Name: Keyf Date: _____ Block: _____

Writing Quadratic Functions in Vertex Form

Write the function in vertex form. Then give the maximum or minimum of the function

1. $f(x) = x^2 - 6x + 9$

$$9 - 9 + y = x^2 - 6x + \frac{9}{1}$$

$$b = -6$$

$$b/2 = -3$$

$$(b/2)^2 = 9$$

$$9 - 9 + y = (x - 3)^2$$

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

vertex @ (3, 0)

min @ y = 0

2. $f(x) = x^2 - 2x - 3$

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

$$b = -2$$

$$(b/2) = -1$$

$$(b/2)^2 = 1$$

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

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

vertex @ (1, -4)

min @ y = -4

3. $f(x) = -7x^2 - 14x$

$$1 + \frac{y}{-7} = x^2 + 2x + \frac{1}{-7}$$

$$b = 2$$

$$(b/2) = 1$$

$$(b/2)^2 = 1$$

$$1 + \frac{y}{-7} = (x + 1)^2$$

$$\frac{y}{-7} = (x + 1)^2 - 1$$

$$y = -7(x + 1)^2 + 7$$

vertex @ (-1, 7)

max @ y = 7

4. $f(x) = 3x^2 - 12x - 9$

$$\frac{9}{3} + \frac{y}{3} = \frac{3x^2}{3} - \frac{12x}{3} - \frac{9}{3}$$

$$\frac{4}{3} + 3 + \frac{y}{3} = x^2 - 4x + \frac{4}{3}$$

$$b = -4$$

$$b/2 = -2$$

$$(b/2)^2 = 4$$

$$7 + \frac{y}{3} = (x - 2)^2$$

$$\frac{y}{3} = (x - 2)^2 - 7$$

$$y = 3(x - 2)^2 - 21$$

vertex @ (2, -21)

min @ y = -21

5. $f(x) = 2x^2 - 6x - 1$

$$\frac{1}{2} + \frac{y}{2} = \frac{2x^2}{2} - \frac{6x}{2} - \frac{1}{2}$$

$$\frac{9}{4} + \frac{1}{2} + \frac{y}{2} = x^2 - 3x + \frac{9}{4}$$

$$b = -3$$

$$\frac{11}{4} + \frac{y}{2} = (x - 3/2)^2$$

$$\frac{y}{2} = (x - 3/2)^2 - \frac{11}{4}$$

$$b/2 = -3/2$$

$$(b/2)^2 = 9/4$$

$$y = 2(x - 3/2)^2 - 11/2$$

vertex @ (3/2, -11/2)

min @ y = -11/2

6. $f(x) = -x^2 + 4x - 1$

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

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

$$b = -4$$

$$b/2 = -2$$

$$(b/2)^2 = 4$$

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

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

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

vertex @ (2, 3)

max @ y = 3

- 5. A company is marketing a new toy. The function $s(p) = -50p^2 + 3000p$ models how the total sales s of the toy, in dollars, depend on the price p of the toy, in dollars.

- a. Write the function in vertex form.

$$y = -50(p+30)^2 + 45,000$$

$$y = -50p^2 + 3000p$$

$$\frac{9000}{-50} + \frac{y}{-50} = p^2 - 60p + \frac{9000}{-50}$$

$$b = -60$$

$$b/2 = -30$$

$$(b/2)^2 = 900$$

- b. What is the vertex of the graph of the function? What does the vertex represent in this situation?

vertex @ (30, 45,000)

it represents a max of \$45,000 in total sales if the toy is priced \$30.

- 6. A circus performer throws a ball from a height of 32 feet. The model $h(t) = -16t^2 + 16t + 32$ gives the height of the ball in feet t seconds after it is thrown.

- a. Write the function in vertex form.

$$y = -16(t - 1/2)^2 + 36$$

$$-32 + y = -16t^2 + 16t$$

$$\frac{1}{4} + 2 + \frac{y}{-16} = t^2 - t + \frac{1}{4}$$

$$\frac{9}{4} + \frac{y}{-16} = (t - 1/2)^2$$

$$b = -1$$

$$b/2 = -1/2$$

$$(b/2)^2 = 1/4$$

- b. What is the maximum height that the ball reaches?

36 feet

$$\frac{9}{-16} = (t - 1/2)^2$$

$$y = -16(t - 1/2)^2 + 36$$

- c. What is a reasonable domain of the function? Explain.

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- d. What is the y -intercept of the function's graph? What does it represent in this situation? What do you notice about the y -intercept and the value of c when the function is written in standard form?

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