SOLUTIONS => 6.6 Vertex Form of a Quadratic Function.

1. For each quadratic function below, identify the following:

i) the direction in which the parabola opens.
ii) the coordinates of the vertex
iii) the equation of the axis of symmetry.

a) $f(x) = (x-3)^2+7$

i) Opens Upward
ii) Vertex: $(3,7)$
iii) Axis of Symmetry: $x=3$

b) $m(x) = -2(x+7)^2 - 3$.

i) Opens Downward
ii) Vertex $(-7, -3)$
iii) Axis of Symmetry: $x = -7$

c) $g(x) = 7(x-2)^2 - 9$

i) Opens Upward
ii) Vertex $(2, -9)$
iii) Axis of Symmetry: $x = 2$

d) $n(x) = \frac{1}{2}(x+1)^2 + 10$

i) Opens Upward
ii) Vertex $(-1, 10)$
iii) Axis of Symmetry: $x = -1$

e) $r(x) = -2x^2 + 5$

$r(x) = -2(x-0)^2 + 5$

i) Opens Downward

ii) Vertex (0, 5)

iii) Axis of Symmetry: $x = 0$

2. Predict which of the following functions have a minimum value. Also predict the {a & c} number of x-intercepts that each function has. Test your predictions by sketching the graph of each function.

a) $f(x) = -x^2 + 3$

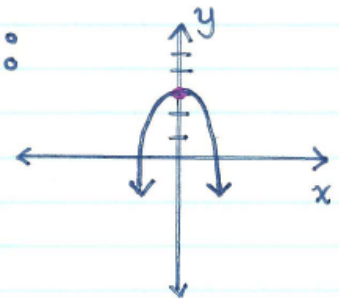
$f(x) = -(x-0)^2 + 3$

Vertex: $(0, 3)$

↳ Opens Downward ⇒ Maximum

↳ 2 x-intercepts

Sketch:



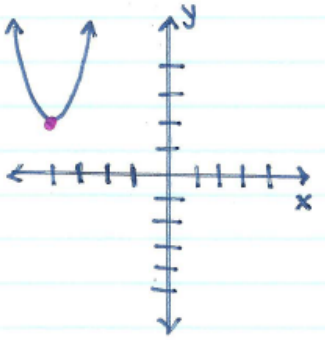
c) $m(x) = (x+4)^2 + 2$

Vertex: $(-4, 2)$

↳ Opens Upward ⇒ Minimum

↳ No x-intercepts

Sketch:



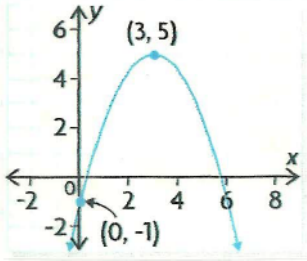
3. Determine the value of a, if point (-1,4) is on the quadratic function:

$$f(x) = a(x+2)^2 + 7$$

$(-1, 4)$
$x \quad y$

$$y = a(x+2)^2 + 7$$
$$4 = a(-1+2)^2 + 7$$
$$4 = a(1)^2 + 7$$
$$4 = a(1) + 7$$
$$4 - 7 = 1a$$
$$\frac{-3}{1} = \frac{1a}{1}$$
$$-3 = a$$

4. Which equation represents the graph? Justify your decision.



* Opens Downward
** Vertex (3,5)
*** c = -1 (0,-1)

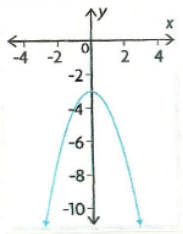
A. $y = -\frac{2}{3}x^2 + 5$

C. $y = -\frac{2}{3}(x-3)^2 + 5$

B. $y = -(x-3)^2 + 5$

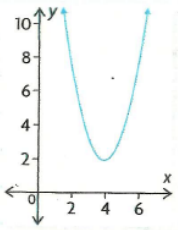
D. $y = \frac{2}{3}(x-3)^2 + 5$

5. Match each equation with its corresponding graph. Explain your reasoning.

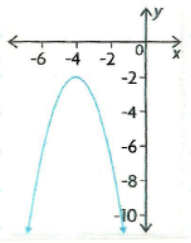
i) 

Match: c) $y = -x^2 - 3$

Vertex (0, -3) ; Opens Downward

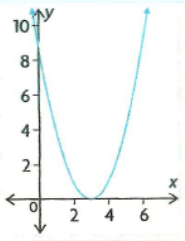
ii) 

Match: d) $y = (x-4)^2 + 2$

iii) 

Match: b) $-(x+2)^2-2$

Vertex $(-4,-2)$; Opens Downward

iv) 

Match: a) $y=(x-3)^2$

Vertex $(3,0)$: Opens Upward

8. Marleen and Candice are both 6 ft tall, and they play on the same college volleyball team. In a game, Candice set up Marleen with an outside high ball for an attack hit. Using a video of the game, their coach determined that the height of the ball above the court, in feet, on its path from Candice to Marleen could be defined by the function

$$h(x) = -0.03(x-9)^2 + 8$$

Where x is the horizontal distance, measured in feet, from one edge of the court.

a) Determine the axis of symmetry of the parabola.

Vertex $(9, 8)$ Axis of Symmetry $x = 9$

b) Marleen hit the ball at its highest point. How high above the court was the ball when she hit it?

The ball was 8 ft above the court when she hit it.

c) How high was the ball when Candice set it, if she was 2 ft from the edge of the court?

$$h = -0.03(x-9)^2 + 8$$
$$h = -0.03(2-9)^2 + 8$$
$$h = -0.03(-7)^2 + 8$$
$$h = -0.03(49) + 8$$
$$h = -1.47 + 8$$
$$h = 6.53 \text{ ft}$$

The ball was 6.53ft high when Candice set it.

d) State the range for the ball's path between Candice and Marleen.

$$\{h \mid 6.5 \leq h \leq 8, h \in R\}$$