

In Summary

Key Idea

- The vertex form of the equation of a quadratic function is written as follows:

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

The graph of the function can be sketched more easily using this form.

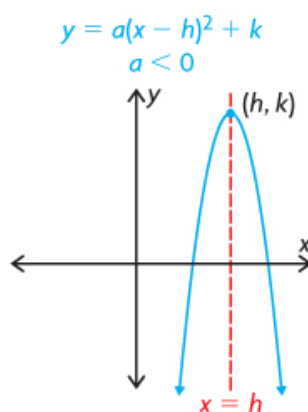
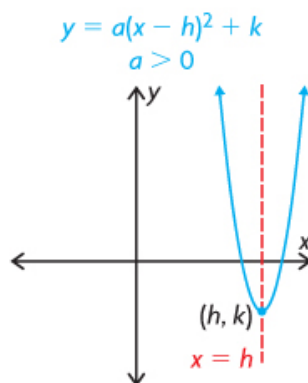
Need to Know

- A quadratic function that is written in vertex form,

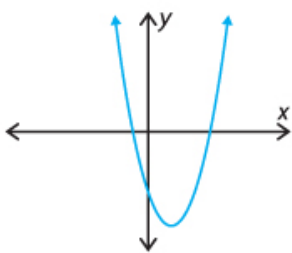
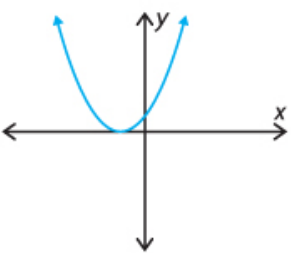
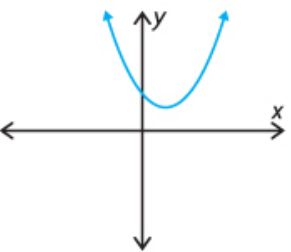
$$y = a(x - h)^2 + k$$

has the following characteristics:

- The vertex of the parabola has the coordinates (h, k) .
- The equation of the axis of symmetry of the parabola is $x = h$.
- The parabola opens upward when $a > 0$, and the function has a minimum value of k when $x = h$.
- The parabola opens downward when $a < 0$, and the function has a maximum value of k when $x = h$.



- A parabola may have zero, one, or two x-intercepts, depending on the location of the vertex and the direction in which the parabola opens. By examining the vertex form of the quadratic function, it is possible to determine the number of zeros, and therefore the number of x-intercepts.

Two x-intercepts	One x-intercept	No x-intercepts
		

Assignment: pages 335 - 337

Questions 1, 2(ac), 3, 4, 5, 8abc

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: $x = -1$

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

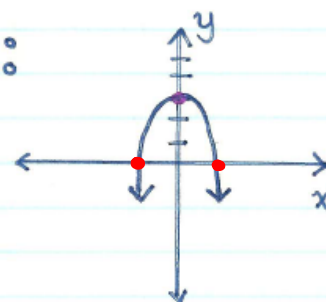
$$r(x) = -2(x-0)^2 + 5$$

- 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 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: $(0, 3)$

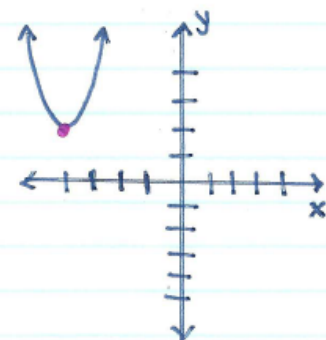
Sketch:



↳ Opens Downward \Rightarrow Maximum
 ↳ 2 x -intercepts

c) $m(x) = (x+4)^2 + 2$
 Vertex: $(-4, 2)$

Sketch:



↳ Opens Upward \Rightarrow Minimum
 ↳ No x -intercepts

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

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

$$\begin{array}{l} (-1, 4) \\ x \quad y \end{array}$$

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

$$4 = a(-1+2)^2 + 7$$

$$4 = a(1)^2 + 7$$

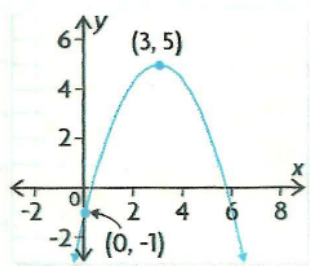
$$4 = a(1) + 7$$

$$4 - 7 = 1a$$

$$\frac{-3}{1} = \frac{1a}{1}$$

$$-3 = a$$

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



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

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

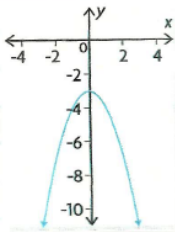
C. $y = -\frac{2}{3}(x-3)^2 + 5$

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.

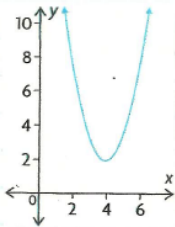
i)



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

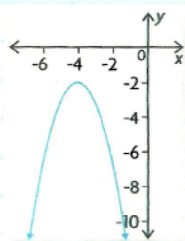
Vertex (0, -3) ; Opens Downward

ii)

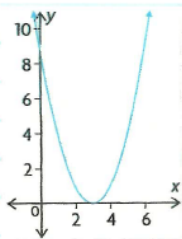


Match: d) $y = (x-4)^2 + 2$

iii)

Match: b) $-(x+4)^2-2$ 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?

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

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

$$h = -0.03(-7)^2 + 8$$

$$h = -0.03(49) + 8$$

$$h = -1.47 + 8$$

$$h = 6.53 \text{ ft}$$

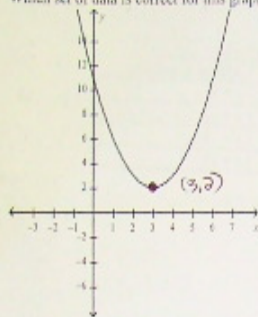
The ball was 6.53 ft high when Candice set it.

Foundations of Math 11 - Chapter 6 Exam Review

Multiple Choice

Identify the choice that best completes the statement or answers the question.

A 1. Which set of data is correct for this graph?



	Axis of Symmetry	Vertex	Domain	Range
A.	$x = 3$	$(3, 2)$	$x \in \mathbb{R}$	$y \geq 2$
B.	$x = 3$	$(2, 3)$	$x \in \mathbb{R}$	$y \in \mathbb{R}$
C.	$x = 2$	$(2, 3)$	$-1 \leq x \leq 7$	$y \geq 2$
D.	$x = 2$	$(3, 2)$	$-2 \leq x \leq 8$	$y \geq 0$

- A) Set A.
- B) Set C.
- C) Set D.
- D) Set B.

A 2. What are the x- and y-intercepts for the function $y = x^2 - 2x - 8$?

- A) $x = -2, x = 4, y = -8$
- B) $x = -2, x = 2, y = -8$
- C) no x-intercepts, $y = -8$
- D) $x = -4, x = 4, y = -8$

$$y = (x - 4)(x + 2) \quad c = -8$$

$$0 = (x - 4)(x + 2)$$

$$x - 4 = 0 \quad | \quad x + 2 = 0$$

$$x = 4 \quad \quad \quad x = -2$$

A 3. The points $(-2, 4)$ and $(1, 4)$ are located on the same parabola. What is the equation for the axis of symmetry for this parabola?

- A) $x = -0.5$
 B) $x = -1$
 C) $x = 0.5$
 D) $x = -1.5$

$$x = \frac{-2+1}{2}$$

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

$$x = -0.5$$

D 4. Solve $x^2 + 5x + 4 = 0$ by factoring.

- A) $x = -5, x = -1$
 B) $x = 5, x = 1$
 C) $x = 4, x = 1$
 D) $x = -4, x = -1$

$$(x+4)(x+1) = 0$$

$$\begin{array}{l|l} x+4=0 & x+1=0 \\ x=-4 & x=-1 \end{array}$$

B 5. Solve $x^2 - 10x - 24 = 0$ by factoring.

- A) $x = 8, x = -3$
 B) $x = -2, x = -12$
 C) $x = 2, x = -12$
 D) $x = -6, x = -4$

$$(x-12)(x+2) = 0$$

$$\begin{array}{l|l} x-12=0 & x+2=0 \\ x=12 & x=-2 \end{array}$$

C 6. Solve $100x^2 - 121 = 0$ by factoring.

- A) $x = 10, x = -11$
- B) $x = \frac{11}{10}, x = -\frac{11}{10}$
- C) $x = \frac{10}{11}, x = -\frac{10}{11}$
- D) $x = 11, x = -11$

$$(10x - 11)(10x + 11) = 0$$

$$10x - 11 = 0 \quad | \quad 10x + 11 = 0$$

$$10x = 11 \quad | \quad 10x = -11$$

$$x = \frac{11}{10} \quad \quad \quad x = -\frac{11}{10}$$

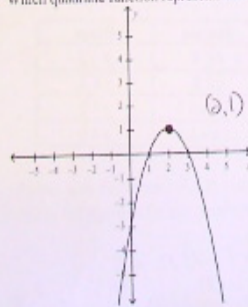
B 7. Which set of data is correct for the quadratic relation $f(x) = -2(x - 12)^2 + 15$?

	Direction parabola opens	Vertex	Axis of Symmetry
A.	downward	(15, -12)	$x = 15$
B.	downward	(12, 15)	$x = 12$
C.	upward	(-12, 15)	$x = -12$
D.	upward	(15, 12)	$x = 15$

- A) Set D.
- B) Set B.
- C) Set A.
- D) Set C.

$a = -2$ downward
 $h = 12$
 $k = 15$
 vertex (12, 15)
 axis of sym: $(x = 12)$

A 8. Which quadratic function represents this parabola?



$h = 2$
 $k = 1$
 $a < 0$ downward
 $y = -(x - 2)^2 + 1$

- A) $y = -(x - 2)^2 + 1$
- B) $y = -(x + 2)^2 - 1$
- C) $y = (x - 2)^2 + 1$
- D) $y = -(x + 2)^2 + 1$

D 9. Solve $2x^2 - 3x + 1 = 0$ using the quadratic formula. $a=2$ $b=-3$ $c=1$

A) $x=1, x=-\frac{1}{2}$

B) $x=1, x=-\frac{1}{2}$

C) $x=-1, x=\frac{1}{2}$

D) $x=1, x=\frac{1}{2}$

$$x = \frac{3 \pm \sqrt{9-8}}{4}$$

$$x = \frac{3 \pm 1}{4}$$

$$x = \frac{4}{4} \quad | \quad x = \frac{2}{4}$$

$$x = 1 \quad | \quad x = \frac{1}{2}$$

B 10. Solve $9x^2 + 6x + 1 = 0$ using the quadratic formula. $a=9$ $b=6$ $c=1$

A) $x=\frac{1}{3}$

B) $x=-\frac{1}{3}$

C) $x=0, x=-\frac{1}{3}$

D) $x=0, x=\frac{1}{3}$

$$x = \frac{-6 \pm \sqrt{36-36}}{18}$$

$$x = \frac{-6 \pm 0}{18}$$

$$x = \frac{-6}{18}$$

$$x = -\frac{1}{3}$$

Short Answer

11. Solve
- $4x^2 + 7x + 3 = 0$
- by
- factoring
- .

$$\left(x + \frac{4}{4}\right)\left(x + \frac{3}{4}\right) = 0$$

$$(x+1)(4x+3) = 0$$

$$\begin{array}{l|l} x+1=0 & 4x+3=0 \\ \hline \boxed{x=-1} & 4x=-3 \\ & \boxed{x=-\frac{3}{4}} \end{array}$$

$$\frac{3}{4} + \frac{4}{4} = 7$$

$$\frac{-3}{4} \cdot \frac{4}{4} = 12$$

12. The graph of a quadratic function has x-intercepts at -4 and 5. Write a quadratic equation in
- standard form
- that has these roots.

$$\begin{array}{l|l} x=-4 & x=5 \\ \hline x+4=0 & x-5=0 \end{array}$$

$$0 = (x+4)(x-5)$$

$$y = x^2 - 5x + 4x - 20$$

$$\boxed{y = x^2 - x - 20}$$

13. Determine the value of
- a
- given that
- $(4, -8)$
- satisfies the quadratic function
- $y = a(x-2)^2 + 4$
- .

$$-8 = a(4-2)^2 + 4$$

$$-12 = a(2)^2$$

$$\frac{-12}{4} = \frac{4a}{4}$$

$$\boxed{-3 = a}$$

$$\boxed{-3 = a}$$

14. Solve $x^2 - x - 5 = 0$ using the quadratic formula. State the solution as exact values.

$$a = 1 \quad b = -1 \quad c = -5$$

$$x = \frac{-(-1) \pm \sqrt{(-1)^2 - 4(1)(-5)}}{2(1)}$$

$$x = \frac{1 \pm \sqrt{1 + 20}}{2}$$

$$x = \frac{1 \pm \sqrt{21}}{2}$$

$$x = \frac{1 + \sqrt{21}}{2} \quad \Bigg| \quad x = \frac{1 - \sqrt{21}}{2}$$

15. Solve $2x^2 + 8x + 2 = 0$ using the quadratic formula. State the solution as exact values.

$$a = 2 \quad b = 8 \quad c = 2$$

$$x = \frac{-(8) \pm \sqrt{(8)^2 - 4(2)(2)}}{2(2)}$$

$$x = \frac{-8 \pm \sqrt{64 - 16}}{4}$$

$$x = \frac{-8 \pm \sqrt{48}}{4}$$

$$x = \frac{-8 \pm \sqrt{2 \cdot 2 \cdot 2 \cdot 3}}{4}$$

$$x = \frac{-8 \pm 4\sqrt{3}}{4} = \frac{-2 \pm \sqrt{3}}{2} = \boxed{\frac{-2 + \sqrt{3}}{2} \text{ or } \frac{-2 - \sqrt{3}}{2}}$$

16. A parabola with the vertex $(-7, -2)$ passes through the point $(-9, 10)$.

Determine the equation for this parabola. Express your final answer in vertex form.

$$h = -7$$

$$k = -2$$

$$a = ?$$

$$x = -9$$

$$y = 10$$

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

$$10 = a(-9+7)^2 - 2$$

$$12 = a(-2)^2$$

$$\frac{12}{4} = \frac{4a}{4}$$

$$3 = a$$

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

Attachments

7s6e1 final.mp4

7s6e2 final.mp4

7s6e3 final.mp4

7s6e4 final.mp4

fm7s6-p9.tns

FM11-7s6-ahk.gsp

FM11-7s6.gsp