

Are there any Homework Questions you would like to see on the board?

pp. 250-252 #3, 4ac, 8, 14

3a 4a 8

Today's Learning Goal(s):

By the end of the class, I will be:

a) Prepared for the unit 4 summative.

ALSO

Review SWYK 4.1

Review SWYK 4.2

**Review Unit 3 Summative
(& SWYK 3.1)**

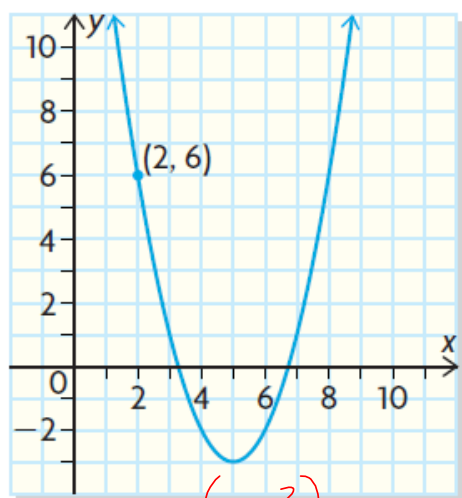
pp. 250-252 #3, 4ac, 8, 14

3a 4a 8

3. Determine the equation of each parabola.

K

a)

(5, -3)
h k

b)

$$y = a(x - 5)^2 - 3$$

$$6 = a(2 - 5)^2 - 3$$

$$6 = a(-3)^2 - 3$$

$$6 + 3 = a(9)$$

$$9 = 9a$$

$$a = 1$$

$$\therefore y = 1(x - 5)^2 - 3$$

4. Write the standard form of the quadratic equation.

	Vertex	y-intercept
a)	(2, 3)	11

pt (0, 11)

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

$$11 = a(0 - 2)^2 + 3$$

$$11 = 4a + 3$$

$$11 - 3 = 4a$$

$$8 = 4a$$

$$\frac{8}{4} = a$$

$$2 = a$$

$$\begin{aligned} \therefore y &= 2(x - 2)^2 + 3 \\ &= 2(x - 2)(x - 2) + 3 \\ &= 2(x^2 - 4x + 4) + 3 \\ &= 2x^2 - 8x + 8 + 3 \\ &= 2x^2 - 8x + 11 \end{aligned}$$

8. The height of an arrow shot by an archer is given in the table.

Determine the equation for a curve of good fit. State any restrictions on the domain and range of your model. Use it to predict when the arrow will hit the ground.

Time (s)	0	0.5	1.0	1.5	2.0	2.5
Height (m)	0.5	9.2	15.5	19.3	20.5	19.3

vertex (2, 20.5)

$$\therefore y = a(x-2)^2 + 20.5$$

$$0.5 = a(0-2)^2 + 20.5$$

$$0.5 = a(4) + 20.5$$

$$0.5 - 20.5 = 4a$$

$$-20 = 4a$$

$$\frac{-20}{4} = a$$

$$a = -5$$

$$\therefore y = -5(x-2)^2 + 20.5$$

$$\text{Range: } \{y \in \mathbb{R} / 0 \leq y \leq 20.5\}$$

$$\text{Domain: } \{x \in \mathbb{R} / 0 \leq x \leq 4.02\}$$

we need to know when it lands.
 $\therefore \text{let } y = 0$

$$y = -5(x-2)^2 + 20.5$$

$$0 = -5(x-2)^2 + 20.5$$

$$= -5(x^2 - 4x + 4) + 20.5$$

$$= -5x^2 + 20x - 20 + 20.5$$

$$= -5x^2 + 20x + 0.5$$

$$a = -5 \quad b = 20 \quad c = 0.5$$

$$x = \frac{-20 \pm \sqrt{20^2 - 4(-5)(0.5)}}{2(-5)}$$

$$= \frac{-20 \pm \sqrt{400 + 10}}{-10}$$

$$x = \frac{-20 + \sqrt{410}}{-10} \quad \text{or} \quad x = \frac{-20 - \sqrt{410}}{-10}$$

$$\approx -0.02$$

inadmissible

$$\approx 4.02$$

\therefore the arrow hits the ground at 4.02 seconds.

MCF 3MI

4.R Unit 4 Review

Date: Nov. 1/19

Recall: Three forms of a **quadratic relation**:**Vertex Form**

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

Standard Form

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

Factored Form

$$y = a(x-r)(x-s)$$

1. Vertex form vs. Standard form

↳ Expand

↳ Complete the Square

 $a=1$ $a \neq 1$

↳ "b" is odd, results in a fraction

$$2x^2 + 6 - 5x = 0$$

2. The Quadratic Formula (
- MUST be memorized**
-)

↳ make sure a, b, and c are in the correct order

$$\text{If } ax^2 + bx + c = 0, \text{ then } x = \frac{-b \pm \sqrt{b^2 - 4ac}}{2a}$$

↳ exact answers vs. 3 decimal places (with " \approx " sign)

3. The Discriminant (
- NOT**
- the whole formula, but
- MUST be memorized**
- also)

↳ know the **CONDITIONS**, AND the 2 **types** of questionsThe expression $b^2 - 4ac$ is the part under the square root sign and is called the "discriminant". It allows us to determine the "nature of the roots" (number of roots and the type of root).

$$b^2 - 4ac > 0 \Rightarrow \text{two distinct real solutions (roots)} \quad (\text{and 2 x-intercepts})$$

$$b^2 - 4ac = 0 \Rightarrow \text{one real solution (root)} \quad (\text{and 1 x-intercept})$$

$$b^2 - 4ac < 0 \Rightarrow \text{no real solution (roots)} \quad (\text{and no x-intercepts})$$

Type 1: given a quadratic equation or quadratic function

↳ calculate the value (with = signs down the left)

↳ give a 2 part conclusion

Type 2: given a quadratic equation WITH A VARIABLE in the equation

↳ calculate the value of k

↳ Begin WITH THE CONDITION being asked

↳ (NO = signs down the left)

Ex. For what value of k does $f(x) = 3x^2 - 6x + k$ have no real roots?

$$\begin{aligned}
 b^2 - 4ac &< 0 & a=3 \quad b=-6 \quad c=k \\
 (-6)^2 - 4(3)(k) &< 0 \\
 36 - 12k &< 0 \\
 -12k &< -36 \\
 k &> \frac{-36}{-12} \\
 k &> 3
 \end{aligned}$$

4. Solving problems

↳ What is being asked? Do we need the vertex or the zeros?

↳ use quadratic formula vs. other methods

↳ compare using last days solutions to p. 240 #7 (on next screen)

5. Determining the equation

↳ What information is given? What form should we start with?

$$\begin{aligned}
 &\hookrightarrow \text{vertex } (3, -7) \quad \hookrightarrow \text{the family of equations} \\
 &y = a(x-h)^2 + k \\
 &y = a(x-3)^2 - 7
 \end{aligned}$$

- p. 240 7. The profit of a shoe company is modelled by the quadratic function $P(x) = -5(x - 4)^2 + 45$, where x is the number of pairs of shoes produced, in thousands, and $P(x)$ is the profit, in thousands of dollars. How many thousands of pairs of shoes will the company need to sell to earn a profit?

$$\text{Let } P(x) = 0$$

$$0 = -5(x - 4)^2 + 45$$

Option 1:

$$0 = -5(x^2 - 8x + 16) + 45$$

$$= -5x^2 + 40x - 80 + 45$$

$$= -5x^2 + 40x - 35$$

$$a = -5 \quad b = 40 \quad c = -35$$

$$x = \frac{-40 \pm \sqrt{40^2 - 4(-5)(-35)}}{2(-5)}$$

$$= \frac{-40 \pm \sqrt{900}}{-10}$$

$$= \frac{-40 \pm 30}{-10}$$

$$x = \frac{-40 + 30}{-10} \quad \text{or} \quad x = \frac{-40 - 30}{-10}$$

$$= \frac{-10}{-10}$$

$$= 1$$

$$= \frac{-70}{-10}$$

$$= 7$$

$\therefore x = 1000$ or $x = 7000$ pairs of shoes
to break even (= 0 profit)

.. sell 1001 pairs to
make a profit

Today's Homework:

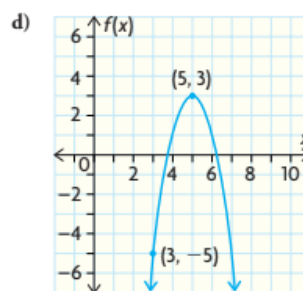
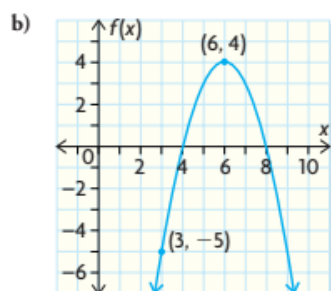
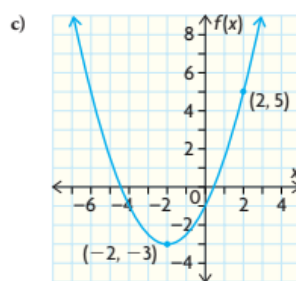
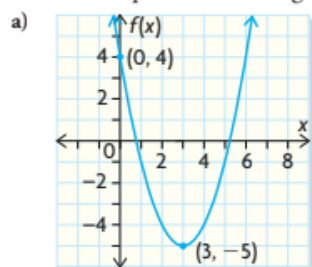
Review pp. 254-255 #1 - 10

Review pp. 254-255 #1 - 10

1. Write in standard form.

- a) $f(x) = (x + 3)^2 - 7$
- b) $f(x) = -(x + 7)^2 + 3$
- c) $f(x) = 2(x - 1)^2 + 5$
- d) $f(x) = -3(x - 2)^2 - 4$

2. Write the equation of each graph in vertex form.



3. Write in vertex form by completing the square.

- a) $f(x) = x^2 + 2x - 15$
- b) $f(x) = -x^2 + 8x - 7$
- c) $f(x) = 2x^2 + 20x + 16$
- d) $f(x) = 3x^2 + 12x + 19$
- e) $f(x) = \frac{1}{2}x^2 - 6x + 26$
- f) $f(x) = 2x^2 + 2x + 4$

4. Determine the vertex, the axis of symmetry, the direction the parabola opens, and the number of zeros for each quadratic function. Sketch a graph of each.
- a) $f(x) = 3(x - 5)^2 - 2$
 - b) $g(x) = -2(x + 3)^2 - 1$
 - c) $f(x) = 2x^2 + 4x + 7$
 - d) $g(x) = -x^2 + 16x - 64$
5. Use the quadratic formula to determine the solutions.
- a) $2x^2 - 15x - 8 = 0$
 - b) $3x^2 + x + 7 = 0$
 - c) $9x^2 = 6x - 1$
 - d) $2.5x^2 = -3.1x + 7$
6. A T-ball player hits a ball from a tee that is 0.6 m tall. The height of the ball at a given time is modelled by the function $h(t) = -4.9t^2 + 7t + 0.6$, where height, $h(t)$, is in metres and time, t , is in seconds.
- a) What will the height be after 1 s?
 - b) When will the ball hit the ground?
7. Without solving, determine the number of real solutions of each equation.
- a) $x^2 - 5x + 9 = 0$
 - b) $3x^2 - 5x - 9 = 0$
 - c) $16x^2 - 8x + 1 = 0$
8. For the function $f(x) = kx^2 + 8x + 5$, what value(s) of k will have
- a) two distinct real solutions?
 - b) one real solution?
 - c) no real solution?

9. The daily production cost, C , of a special-edition toy car is given by the function $C(t) = 0.2t^2 - 10t + 650$, where $C(t)$ is in dollars and t is the number of cars made.
- How many cars must be made to minimize the production cost?
 - Using the number of cars from part (a), determine the cost.
10. The function $A(w) = 576w - 2w^2$ models the area of a pasture enclosed by a rectangular fence, where w is width in metres.
- What is the maximum area that can be enclosed?
 - Determine the area that can be enclosed using a width of 20 m.
 - Determine the width of the rectangular pasture that has an area of 18 144 m².