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

pp. 250-252 #3, 4ac, 5, 8, 14

Today's Learning Goal(s):

By the end of the class, I will be:

a) Prepared for the unit 4 summative.

Correct SWYK 4.2

Review SWYK 4.1

Review Unit 3 Summative
(& Quizzes 3.1 & 3.2)

p. 250 #4a

4. Write the standard form of the quadratic equation.

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

$\rightarrow (0, 11)$

(h,k)

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

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

$11 = a(4) + 3$

$11 = 4a + 3$

$11 - 3 = 4a$

$8 = 4a$

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

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

is the eqn in vertex form.

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

$= 2(x^2 - 4x + 4) + 3$

$= 2x^2 - 8x + 8 + 3$

$\therefore y = 2x^2 - 8x + 11$

is the eqn in standard form.

p. 250 #5c

5. A car skids in an accident. The investigating police officer knows that
[A] the distance a car skids depends on the speed of the car just before the brakes are applied.

Speed (km/h)	0	10	20	30	40	50	60	70	80	90	100
Length of Skid (m)	0.0	0.7	2.8	6.4	11.4	17.8	25.7	35.0	45.7	57.8	71.4

a) Create a scatter plot of the data in the table, and draw a curve of good fit.
b) Determine an equation of the curve of good fit. Assume that there is only one zero, located at the origin.
c) Use the curve to determine the length of the skid mark to the nearest tenth of a kilometre if the initial speed was 120 km/h.
d) State any restrictions on the domain and range of your model.

MCF 3MI   4.R Unit 4 Review

Date: *Apr. 11/18*

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

Vertex Form	Standard Form	Factored Form
$y = a(x\text{-}h)^2 + k$	$y = ax^2 + bx + c$	$y = a(x\text{-}r)(x\text{-}s)$

$y = 3(x-4)^2 + 5$

1. Vertex form vs. Standard form

    ↳Expand   ↳Complete the Square ⟨ $a=1$
                                                          $a \neq 1$
                                                  "*b*" is odd,   results in a fraction

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

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

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

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

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

    ↳know the **CONDITIONS**, AND the 2 *types* of questions

    The 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).

    $b^2 - 4ac > 0$ ⟹ *two distinct real solutions* (roots)   (and 2 *x*-intercepts)
    $b^2 - 4ac = 0$ ⟹ *one real solution* (root)   (and 1 *x*-intercept)
    $b^2 - 4ac < 0$ ⟹ *no real solution* (roots)   (and no *x*-intercepts)

    Type 1: given a quadratic equation or quadratic function $a=3\ \ b=5\ \ c=6$
    ↳calculate the value (with = signs down the left) $b^2 - 4ac$
       ↳give a 2 part conclusion $= (5)^2 - 4(3)(6)$
                                                          $= 25 - 72$
    Type 2: given a quadratic equation WITH A VARIABLE in the equation
    ↳calculate the value of *k* $= -47 \quad \therefore b^2 - 4ac < 0$
       ↳Begin WITH THE CONDITION being asked $\therefore$ no real solution
              ↳(NO = signs down the left)

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

    $b^2 - 4ac < 0$ $a = 3\ \ b = -6\ \ c = k$

    $(-6)^2 - 4(3)(k) < 0$

    $36 - 12k < 0$

    $-12k < -36$

    $k > \dfrac{-36}{-12}$

    $k > 3$

4. Solving problems

    ↳What is being asked? Do we need the vertex of 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?

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?

Let $P(x) = 0$

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

Option 1:

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

$\dfrac{-45}{-5} = (x-4)^2$

$9 = (x-4)^2$

$\pm\sqrt{9} = x - 4$

$4 \pm 3 = x$

$x = 4+3$ or $x = 4-3$

$\quad y = 7 \qquad\qquad = 1$

$\therefore$ 1000 or 7000 pairs of shoes breaks even.

$\therefore$ sell 1001 pairs to make a profit

Option 2:

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

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

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

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

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

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

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

$x = \dfrac{-40 + 30}{-10}$ or $x = \dfrac{-40 - 30}{-10}$

$= \dfrac{-10}{-10} \qquad\qquad = \dfrac{-70}{-10}$

$= 1 \qquad\qquad\qquad = 7$

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

Today's Homework: Review pp. 254-255 #1 - 10

1. Write in standard form.
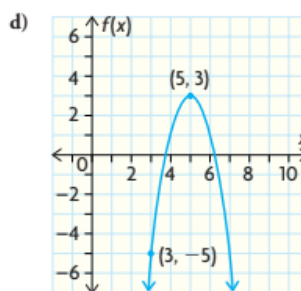
   a) $f(x) = (x + 3)^2 - 7$
   b) $f(x) = -(x + 7)^2 + 3$
   c) $f(x) = 2(x - 1)^2 + 5$
   d) $f(x) = -3(x - 2)^2 - 4$

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

  a)

  c)

  b)

$$y = a(x-6)^2 + 4$$
$$-5 = a(3-6)^2 + 4$$

  d)
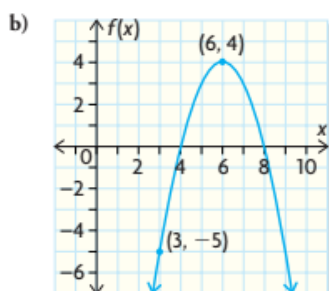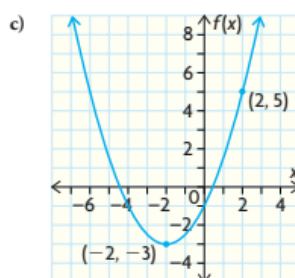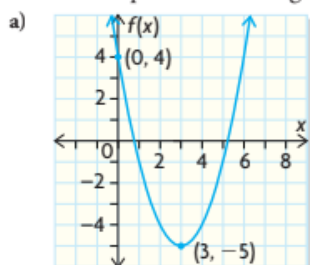
3. Write in vertex form by completing the square.

   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) $f(x) = 3(x - 5)^2 - 2$ $\text{U}(5, -2)$

b) $g(x) = -2(x + 3)^2 - 1$

c) $f(x) = 2x^2 + 4x + 7$ $A\text{N}S: X = 5$

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.

a) How many cars must be made to minimize the production cost?

b) 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.

a) What is the maximum area that can be enclosed?

b) Determine the area that can be enclosed using a width of 20 m.

c) Determine the width of the rectangular pasture that has an area of 18 144 m^2.