Are there any questions from last day's assigned work you would like to see on the board?

pp. 239-241 # 2, 4 – 8, 13 **AND**
READ p. 253 **AND**
Work ahead on Review: pp. 254-255 # 1 – 10

Today's Learning Goal(s):

By the end of the class, I will be able to:

a) Determine the equation of a curve using vertex form.

p. 240

3. A cliff diver dives from about 17 m above the water. The diver's height above the water, $h(t)$, in metres, after t seconds is modelled by $h(t) = -4.9t^2 + 1.5t + 17$. Explain how to determine when the diver is 5 m above the water.

4. Determine when the diver in question 3 is 5 m above the water.

Let $h(t) = 5$ $\leftrightarrow h(t)$

$5 = -4.9t^2 + 1.5t + 17$

$0 = -4.9t^2 + 1.5t + 17 - 5$

$= -4.9t^2 + 1.5t + 12$

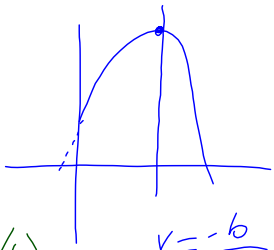
$a = -4.9 \quad b = 1.5 \quad t = 12$

$$t = \frac{-(1.5) \pm \sqrt{(1.5)^2 - 4(-4.9)(12)}}{2(-4.9)}$$

p. 240 **5.** The function $P(x) = -30x^2 + 360x + 785$ models the profit, $P(x)$, earned by a theatre owner on the basis of a ticket price, x. Both the profit and ticket price are in dollars. What is the maximum profit, and how much should the tickets cost?

K

$P(x) = -30x^2 + 360x + 785$



AofS: $x = \frac{-b}{2a}$

$= \frac{-360}{2(-30)}$

$= \frac{-360}{-60}$

$= 6$

$\rightarrow P(6) = -30(6)^2 + 360(6) + 785$

$= 1865$

$\therefore$ the max profit is \$1865, and tickets should cost \$6.

$x = \frac{-b}{2a}$

$P(x) = -30(x-6)^2 + 1865$

p. 240 **6.** The population of a town is modelled by the function $P(t) = 6t^2 + 110t + 4000$, where $P(t)$ is the population and t is the time in years since 2000.

A

a) What will the population be in 2020?

b) When will the population be 6000?

c) Will the population ever be 0? Explain your answer.

a) year 2020

$t = 2020 - 2000$

$= 20$

$P(20) = 6(20)^2 + 110(20) + 4000$

$= 8600$

$\therefore$ the population in 2020 will be 8600.

b) $P(t) = 6000$?

$6000 = 6t^2 + 110t + 4000$

$0 = 6t^2 + 110t + 4000 - 6000$

$0 = 6t^2 + 110t - 2000$

c) will $P(t) = 0$

$0 = 6t^2 + 110t + 4000$

$b^2 - 4ac$

$= (110)^2 - 4(6)(4000)$

$= 12100 - 96000$

$= -83900$

$\therefore b^2 - 4ac < 0$

$\therefore$ the population will never be 0.

MCF 3MI 4.6 Using Vertex Form to Create Quadratic Models (from Data)

Date: Oct. 31/19

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

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

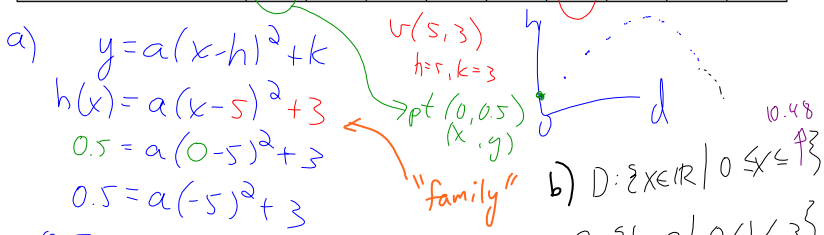
Ex.1: A hose sprays a stream of water across a lawn. (p.244 1

The table shows the approximate height of the stream above the lawn at various distances from the person holding the nozzle.

a) Determine an algebraic model (in vertex form) that relates the height of the water to the distance from the person.
b) State any restrictions on the domain and range of the model.
c) Use the model to predict when the water will hit the ground.

Distance from Nozzle (m)	0	1	2	3	4	5	6	7	8
Height above Lawn (m)	0.5	1.4	2.1	2.6	2.9	3.0	2.9	2.5	1.9

vertex



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

$h(x) = a(x-5)^2 + 3$

$0.5 = a(0-5)^2 + 3$

$0.5 = a(-5)^2 + 3$

$0.5 = 25a + 3$

$0.5 - 3 = 25a$

$-2.5 = 25a$

$\frac{-2.5}{25} = a$

$\therefore a = -\frac{1}{10}$

or $= -0.1$

$\therefore h(x) = -0.1(x-5)^2 + 3$ is the equation.

V(5, 3) h=5, k=3

pt (0, 0.5) (x, y)

"family"

b) $D: \{x \in \mathbb{R} \mid 0 \le x \le 10.48\}$

$R: \{h \in \mathbb{R} \mid 0 \le h \le 3\}$

c) $h(x) = 0$

$0 = -0.1(x-5)^2 + 3$

$= -0.1(x-5)(x-5) + 3$

$= -0.1(x^2 - 5x - 5x + 25) + 3$

$= -0.1(x^2 - 10x + 25) + 3$

$= -0.1x^2 + 1x - 2.5 + 3$

$= -0.1x^2 + x + 0.5$

$a = -0.1 \quad b = 1 \quad c = 0.5$

$h(x) = -0.1(x-5)^2 + 3$

$x = \frac{-b \pm \sqrt{b^2 - 4ac}}{2a}$

$= \frac{-(1) \pm \sqrt{(1)^2 - 4(-0.1)(0.5)}}{2(-0.1)}$

$= \frac{-1 \pm \sqrt{1 + 0.2}}{-0.2}$

$= \frac{-1 \pm \sqrt{1.2}}{-0.2}$

10.477 sec

$x = \frac{-1 + \sqrt{1.2}}{-0.2}$ or $x = \frac{-1 - \sqrt{1.2}}{-0.2}$

$\doteq -0.477$ inadmissible

$\doteq 10.477$

$\doteq 10.48$ m

$\therefore$ the water will hit the ground 10.48 m from the hose

Today's Homework:

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