Hwk Check

9. The graph of the function $f(x) = x^2 - kx + k + 8$ touches the x-axis at one point. What are the possible values of k?

$\Rightarrow$ one zero

$\Rightarrow$ discriminant $= 0$

$f(x) = x^2 - kx + (k+8)$

$a = 1 \quad b = -k \quad c = k+8$

$b^2 - 4ac = 0$

$(-k)^2 - 4(1)(k+8) = 0$

$k^2 - 4(k+8)$

$k^2 - 4k - 32 = 0$

$\Rightarrow (k-8)(k+4) = 0$

$\therefore k = 8$ or $k = -4$

Chapter 3 – Quadratic Functions

3.5 – Solving Quadratic Equations

Note that last day we looked at section 3.6. We now go back to 3.5 as this is a better order for the concepts.

Before beginning we should look at the difference between a Quadratic **Function** and a Quadratic **Equation**. A function such as $f(x) = 3x^2 - 5x + 1$ has a graph with **infinitely** many points. On the other hand, a quadratic equation (in standard form) looks like:

$$3x^2 - 5x + 1 = 0$$

(*What is the difference between the function and the equation?*)

In section 3.6 we saw how to find the **zeroes** of quadratic functions, using the techniques of factoring, the quadratic formula or using graphing technology. As it turns out, solving a quadratic equation is **Exactly** the same as finding zeros of quadratic functions

Quadratic equations, therefore can have 2, 1, or 0 **solutions**/roots

Example 3.5.1

Solve the equations:

a) $x^2 - 5x - 14 = 0$

$(x+2)(x-7) = 0$

$\therefore x = -2$ or $x = 7$

b) $2x^2 + 5x = 2x + 4$

$\Rightarrow 2x^2 + 3x - 4 = 0$

$a = 2 \quad b = 3 \quad c = -4$

dnf

$\Rightarrow$ QF

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

$= \dfrac{-3 \pm \sqrt{(3)^2 - 4(2)(-4)}}{2(2)}$

$= \dfrac{-3 \pm \sqrt{41}}{4}$

$\therefore x = \dfrac{-3 + \sqrt{41}}{4}$ or $x = \dfrac{-3 - \sqrt{41}}{4} = -2.35$

To solve quadratic eqns we need "standard form" "stuff" = 0

written in descending order

Example 3.5.2

Use graphing technology to solve $-2.3x^2 - 1.32x = -1.45$

$$\Rightarrow -2.3x^2 - 1.32x + 1.45 = 0$$

$\therefore x = -1.125$ or $x = 0.56$ by Desmos.

Example 3.5.3 (From your text: Pg. 178 #6a)

profit = 0

6. Determine the break-even quantities for each profit function, where x is the number sold, ~~in thousands.~~

a) $P(x) = -x^2 + 12x + 28$

A beautiful thing about eqn's

$$\Rightarrow -x^2 + 12x + 28 = 0$$

$$\Rightarrow x^2 - 12x - 28 = 0$$

$$\Rightarrow (x+2)(x-14) = 0$$

$\therefore$ we must sell 14,000 objects to break even.

inadmissible (we can't sell -'ve quantities)

$\therefore x = -2$ or $x = 14$

8. The population of a region can be modelled by the function $P(t) = 0.4t^2 + 10t + 50$, where $P(t)$ is the population in thousands and t is the time in years since the year 1995.

a) What was the population in 1995?

b) What will be the population in 2010?

c) In what year will the population be at least 450 000? Explain your answer.

a) $1995 \Rightarrow t = 0$

$\therefore P(0) = 50$ $\therefore$ 50 000 people

b) $2010 \Rightarrow t = 15$

$\therefore P(15) = 0.4(15)^2 + 10(15) + 50 = 290$ $\therefore$ In 2010 we have 290 000 people.

c) $P(t) = 450$

$\Rightarrow 450 = 0.4t^2 + 10t + 50$

$\Rightarrow 0.4t^2 + 10t - 400 = 0$

inadmissible

$\therefore t = -46.5$, $t = 21.5$

$\therefore$ in the year 2016

Class/Homework – Pg 177 – 178 #2bcd, 4abef, 6cd, 7 (*Hint: what is the height of the ball when it is on the ground?*)**, 9, 11 (#9 and 11 are tricky – ask for help!), 14**