PC11

Unit 4: Quadratic Equations

➢ To solve a quadratic equation is to find the solution(s) that satisfy the equation.
➢ Three scenarios are possible:

The equation has 2 solutions	The equation has 1 solution	The equation has no real solution

➢ Solution(s) to a quadratic equation can be referred to in different ways:

- o zero(s)

- o x-intercept(s)

- o root(s)

- o solution(s)

Methods of Solving Quadratic Equations

➢ There are several methods to solve quadratic equations. Each method has its strengths and weaknesses:

1. Graphing: Every quadratic equation can be solved with graphing technology. Without graphing technology, only small integral solutions are easy to find by graphing. Furthermore, not every graphing technology is able to provide exact solutions if the solutions are irrational. The solution(s) is (are) the x-coordinate(s) of the x-intercept(s) if they exist. If there are not x-intercepts, we write: "There is no real solution."

Advantages	Disadvantages
• Quick when using graphing technology. • Quick if the equation is in vertex form and the solutions are small integral values.	• Difficult without graphing technology if the solutions are large numbers. • Difficult to obtain exact values is solutions are irrational

2. Factoring: This method is suitable for equations in standard form with integral coefficient.

Advantages	Disadvantages
• Quick if the equation is factorable.	• Impossible if the equation is not factorable over integers.

3. Square root principle: This method is suitable for equations in vertex form and for equations in standard form $ax^2 + bx + c = 0$ where $b = 0$ and c may or may not be zero.

Advantages	Disadvantages
• Quick if the equation is in vertex form. • Quick when the standard form does not have the middle term. • Quick when the standard form does not have the middle term (bx) and the constant term (c).	• Time consuming when a standard form has to be converted to vertex form by completing the square. • One has to be careful to account for both square roots – the principal one and the negative one. As you know this is very easy to forget.

4. Quadratic formula: Using a quadratic formula is a universal method. It works only for equations in standard form.

Advantages	Disadvantages
• Quick if the equation is in standard form. • Always works. Well, until it does not. But you do not need to worry bout it until third year of university…or ever ☺	• Sometimes more consuming when the equation is factorable. • Time consuming when the equation is in vertex form. An equation in vertex form has to be converted (by distribution and collecting like terms) to standard form first. • It is easy to make a mistake when the equation resembles the standard form but the terms are not written in descending order of their degree.

Nature of the Roots

➢ Sometimes you may be asked to determine the nature of the roots (solutions, zeroes). **Your answer must include information about the number of roots and whether they are real or not**. You can also include information whether the roots are rational or irrational.

➢ There is an effective method to answer this question. This will be taught later in this unit.