Section P6: Solving Quadratic Equations

- A quadratic equation can be written in the form: ax^2+bx+c (where a≠0)
- Quadratic equations could be solved either graphically (***by finding the x-intercepts***) or algebraically using one of the following methods:

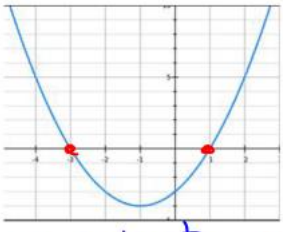
1. Factoring (**example 1 p40**)
2. Extracting Square roots (**example 2 page 41**)
3. Completing the square (**example 3 page 42**)
4. Using the Quadratic formula (**example 4 page 42**)

$(x+2)^2 = 5$

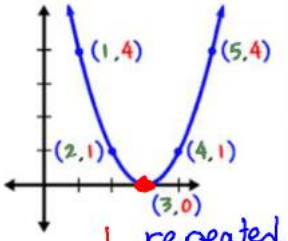
Always works.

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

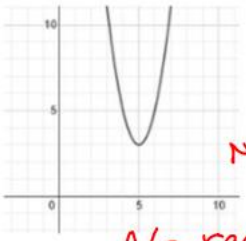
- The graph of a quadratic function (parabola) could have the following 3 positions in the coordinate plane:



2 distinct real solutions



1 repeated real sol



No x-int

No real Sol (2 imaginary)

- Therefore, a quadratic equation could have:
- 2 real solutions (**2 x intercepts**)
- 1 Real solution (**1 x intercept**)
- No real solution (complex solution) **No x intercept**

Discriminant

- To find the number of real solution of a quadratic equation, calculate the discriminant: $b^2 - 4ac$

- If $b^2 - 4ac$>0 (**positive**) then there are 2 real solutions
- If $b^2 - 4ac$=0 then there is one real solution
- If $b^2 - 4ac$ <0 (**negative**) then there is NO real solution, there is a **complex conjugate pair** of solutions.

Note: conjugate of a+bi is a-bi

$2+3i$ $2-3i$

Example

Use the discriminant to find the number of real solutions of the following equation, then solve it algebraically:

$$x^2 + x + 1 = 0$$

$a = 1 \qquad b = 1 \qquad c = 1$

- $b^2 - 4ac = 1^2 - 4(1)(1) = 1 - 4 = -3$ No real sol
- $X = \dfrac{-b \pm \sqrt{b^2 - 4ac}}{2a}$

$X = \dfrac{-1 \pm \sqrt{-3}}{2}$

$X = \dfrac{-1 \pm \sqrt{3}\,i}{2}$

$X = -\frac{1}{2} \pm \frac{\sqrt{3}}{2} i$

complex conjugate pair (2 imaginary solutions)

Same real, opposite imaginary → conjugate pair

$X = -\frac{1}{2} + \frac{\sqrt{3}}{2} i$

$X = -\frac{1}{2} - \frac{\sqrt{3}}{2} i$

Homework

- Page 53# 41 through 44
- Also start reviewing for chapter P mini test on Tuesday 09/19
- I can statements will be on the blog
- Review all textbook problems that were assigned throughout this chapter
- Last section P7 on Monday