The Quadratic Formula

This proof is not required

$$ax^2 + bx + c = 0$$

$$x^2 + \frac{b}{a}x + \frac{c}{a} = 0$$

$$\left(x + \frac{b}{2a}\right)^2 + \frac{c}{a} - \frac{b^2}{4a^2} = 0$$

$$\left(x + \frac{b}{2a}\right)^2 = \frac{b^2}{4a^2} - \frac{c}{a}$$

$$\left(x + \frac{b}{2a}\right)^2 = \frac{b^2 - 4ac}{4a^2}$$

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

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

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

The Quadratic Formula – must learn

The solution to $ax^2 + bx + c = 0$

is given by

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

Ex 1 $\quad x^2 - 7x + 5 = 0$

$a = 1$

$b = -7$

$c = 5$

$$x = \frac{+7 \pm \sqrt{(-7)^2 - 4(1)(5)}}{2 \times 1}$$

$$x = \frac{+7 \pm \sqrt{49 - 20}}{2}$$

$$x = \frac{+7 + \sqrt{29}}{2} \quad \text{or} \quad x = \frac{+7 - \sqrt{29}}{2}$$

$$\underline{x = 6.19} \qquad \underline{x = 0.807}$$

Ex 2 $\quad 5x^2 + 4x - 3 = 0$

$a = 5$
$b = 4$
$c = -3$

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

$$x = \frac{-4 \pm \sqrt{4^2 - 4(5)(-3)}}{2 \times 5}$$

$$x = \frac{-4 \pm \sqrt{16 + 60}}{10}$$

$$x = \frac{-4 \pm \sqrt{76}}{10}$$

$$x = \frac{-4 + \sqrt{76}}{10} \quad \text{or} \quad x = \frac{-4 - \sqrt{76}}{10}$$

$$x = 0.472 \qquad x = -1.27$$

Exercise $\quad$ Solve

1) $x^2 + 7x - 8 = 0$

$x = 1 \quad$ or $\quad x = -8$

2) $2x^2 + 11x + 5 = 0$

$x = -\frac{1}{2}$ or $x = -5$

3) $3x^2 - 7x - 6 = 0$

$x = 3$ or $x = -\frac{2}{3}$

4) $7x^2 + 15x + 3 = 0$

$x = -0.223$ or $x = -1.92$

5) $6x^2 + 5x - 8 = 0$

$x = 0.811$ or $x = -1.64$

6) $4x^2 + 10x + 3 = 0$

$x = -0.349$ or $x = -2.15$

7) $3x^2 - x - 1 = 0$

$x = 0.768$ or $x = -0.434$

8) $9x^2 - 11x + 3 = 0$

$x = 0.811$ or $x = 0.411$

9) $x^2 - 56 + 11 = 0$

$x = 55.8$ or $x = 0.197$