§0.8 - Quadratic Equations:

Recall:

. Linear equation is an equation of the form $ax+b=0$.

Definition:

A quadratic equation in the variable x is an equation of the form

$$ax^2+bx+c=0 \quad , \quad a\neq 0,\ b,c \text{ are constants}$$

To find a Solution for quadratic equation

- Factoring
- Formula (powerful tool)

1- Solution by factoring

Example 1: Solve $x^2+x-12=0$

$$(x+4)(x-3)=0$$

$$x+4=0 \qquad x-3=0$$

$$\boxed{x=-4} \qquad \boxed{x=3}$$

Solution set $=\{-4,3\}$

Exercise: Solve $t^2+3t+2=0$

Example 2: Solve $6w^2 = 5w$.

$$6w^2 - 5w = 0$$

$$w(6w - 5) = 0$$

$w = 0$ or $6w - 5 = 0$

$w = \frac{5}{6}$

Solution Set $= \{0, \frac{5}{6}\}$

Example 3: Solve $(3x - 4)(x + 1) = -2$

$$3x^2 + 3x - 4x - 4 = -2$$

$$3x^2 - x - 2 = 0$$

$$(3x + 2)(x - 1) = 0$$

$3x + 2 = 0$ or $x - 1 = 0$

$x = \frac{-2}{3}$ or $x = 1$

Solution Set $= \{\frac{-2}{3}, 1\}$

Exercise: Solve $4x - 4x^3 = 0$

Exercise: Solve $x(x+2)^2(x+5) + x(x+2)^3 = 0$

2- Quadratic Formula

$ax^2 + bx + c = 0$ has two solutions, namely

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

Exercise: Solve $x^2+2x-24=0$.

Exercise: Solve $9y^2+6\sqrt{2}y+2=0$.

Exercise: Solve $z^2+z+1=0$.

Example: Solve $\frac{1}{x^6}+\frac{9}{x^3}+8=0$

Notice that, the equation is the same as

$$\underbrace{\left(\frac{1}{x^3}\right)}_{w}^2+9\underbrace{\left(\frac{1}{x^3}\right)}_{w}+8=0 \rightsquigarrow w^2+9w+8=0$$

$$(w+8)(w+1)=0$$

$w=-8$ or $w=-1$

$1=-8x^3$ or $1=-x^3$

$\boxed{x=-\frac{1}{2}}$ $\boxed{x=-1}$