

Equations du 2^e degré

$$ax^2 + bx + c = 0 \quad \Delta = b^2 - 4ac$$

$$\Delta < 0 \quad \text{aucune solution} \quad S = \emptyset$$

$$\Delta = 0 \quad \text{1 solution (double)} \quad x_1 = \frac{-b}{2a} \quad S = \left\{ \frac{-b}{2a} \right\}$$

$$\Delta > 0 \quad \text{2 solutions} \quad x_{1,2} = \frac{-b \pm \sqrt{\Delta}}{2a} \quad S = \{x_1; x_2\}$$

Exemples

a) $x^2 - 2x + 3 = 0$
 $a=1 \quad b=-2 \quad c=3$

$$\Delta = b^2 - 4ac = (-2)^2 - 4 \cdot 1 \cdot 3 = 4 - 12 = -8 < 0 \quad S = \emptyset$$

b) $2x^2 - 6x + \frac{9}{2} = 0 \quad | \cdot 2$

$$4x^2 - 12x + 9 = 0$$

$$\Delta = (-12)^2 - 4 \cdot 4 \cdot 9 = 144 - 144 = 0$$

$$x = \frac{12}{8} = \frac{3}{2} \quad \Rightarrow \quad S = \left\{ \frac{3}{2} \right\}$$

c) $6x^2 + x - 15 = 0$

$$\Delta = 1^2 - 4 \cdot 6 \cdot (-15) = 1 + 360 = 361$$

$$x_{1,2} = \frac{-1 \pm 19}{12} = \begin{cases} \frac{-20}{12} = -\frac{5}{3} \\ \frac{18}{12} = \frac{3}{2} \end{cases} \quad \Rightarrow \quad S = \left\{ -\frac{5}{3}; \frac{3}{2} \right\}$$

d) $x^2 - 2x = 1$

$$x^2 - 2x - 1 = 0$$

$$\Delta = (-2)^2 - 4 \cdot 1 \cdot (-1) = 4 + 4 = 8$$

$$x_{1,2} = \frac{2 \pm \sqrt{8}}{2} = \frac{2 \pm 2\sqrt{2}}{2} = \frac{2}{2} \pm \frac{2\sqrt{2}}{2} = 1 \pm \sqrt{2}$$

$$\sqrt{8} = \sqrt{4 \cdot 2} = \sqrt{4} \cdot \sqrt{2} = 2\sqrt{2}$$

$$\Rightarrow S = \{1 \pm \sqrt{2}\}$$

Equations factorisées

principe :

$$A \cdot B = 0 \Leftrightarrow A = 0 \text{ ou } B = 0$$

Exemples :

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

$$x+4 = 0 \quad \text{ou} \quad x-3 = 0$$

$$x = -4 \quad \text{ou} \quad x = 3$$

$$\Rightarrow S = \{-4; 3\}$$

b) $-7x(x-5) = 0$

$$-7x = 0 \quad \text{ou} \quad x-5 = 0$$

$$x = 0 \quad \text{ou} \quad x = 5$$

$$\Rightarrow S = \{0; 5\}$$

c) $(3x-5)(6x+7) = 0$

$$3x-5 = 0 \quad \text{ou} \quad 6x+7 = 0$$

$$x = \frac{5}{3}$$

$$x = -\frac{7}{6}$$

$$\Rightarrow S = \left\{-\frac{7}{6}; \frac{5}{3}\right\}$$

d) $(3x+8)^2 = 0$

$$3x+8 = 0$$

$$3x = -8$$

$$x = -\frac{8}{3}$$

(double)

$$\Rightarrow S = \left\{-\frac{8}{3}\right\}$$