

Systèmes non linéaire

méthode de substitution

exple :
$$\begin{cases} (1) & x^2 - y - 4 = 0 \\ (2) & y + 1 = 2x \end{cases}$$

$$\begin{array}{ll} (2) \Rightarrow y = 2x - 1 & (1) \Rightarrow x^2 - (2x - 1) - 4 = 0 \end{array}$$

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

$$\Leftrightarrow (x - 3)(x + 1) = 0$$

$$\Rightarrow x = \begin{cases} 3 & \Rightarrow y = 2 \cdot 3 - 1 = 5 & \Rightarrow (3; 5) \\ -1 & \Rightarrow y = 2(-1) - 1 = -3 & \Rightarrow (-1; -3) \end{cases}$$

$$\Rightarrow S = \{ (3; 5); (-1; -3) \}$$

mais

1) isoler une inconnue

2) substituer dans l'autre équation.

3) résoudre l'équation obtenue

Ex 2.5.22

$$b) \begin{cases} (1) \frac{x}{y} - \frac{y}{x} = \frac{5}{6} \\ (2) x + y = 30 \end{cases} \Rightarrow y = 30 - x$$

$$\stackrel{(1)}{\Rightarrow} \frac{x}{30-x} - \frac{30-x}{x} = \frac{5}{6}$$

$$v.i: \begin{array}{l} 30-x \neq 0 \\ \downarrow \\ 30 \end{array} \quad \begin{array}{l} x \neq 0 \\ \downarrow \\ 0 \end{array}$$

$$6x^2 - (6(30-x)^2) = 5x(30-x) \quad \text{ppmc: } 6x(30-x)$$

$$6x^2 - 6(900 - 60x + x^2) = 150x - 5x^2$$

$$\cancel{6x^2} - 5400 + 360x - \cancel{6x^2} = 150x - 5x^2$$

$$5x^2 + 210x - 5400 = 0 \quad | : 5$$

$$x^2 + 42x - 1080 = 0 \quad \Delta = 6084 = 78^2$$

$$x_{1,2} = \frac{-42 \pm 78}{2} = \begin{cases} 18 \checkmark \Rightarrow y = 30 - 18 = 12 \\ -60 \checkmark \Rightarrow y = 30 - (-60) = 90 \end{cases} \Rightarrow S = \{(18, 12); (-60, 90)\}$$

$$c) \begin{cases} \frac{1}{x} + \frac{1}{y} = \frac{M}{10} \\ x + y = M \end{cases} \Rightarrow y = M - x$$

$$\Rightarrow \frac{1}{x} + \frac{1}{M-x} = \frac{M}{10}$$

v.i. : 0 et M

ppmc : $10x(M-x)$

$$\Rightarrow 10(M-x) + 10x = Mx(M-x)$$

$$110 - 10x + 10x = 121x - Mx^2$$

$$Mx^2 - 121x + 110 = 0 \quad | \div M$$

$$x^2 - Mx + 110 = 0$$

$$(x-10)(x-1) = 0$$

$$\Rightarrow x = \begin{cases} 10 & \Rightarrow y = M - 10 = 1 \\ 1 & \Rightarrow y = M - 1 = 10 \end{cases}$$

$$\Rightarrow S = \{(10; 1); (1; 10)\}$$