

problem (1)

solutions

- (a) \rightarrow Linear
 (b) \rightarrow Not linear
 (c) \rightarrow Linear
 (d) \rightarrow not linear
 (e) \rightarrow not linear
 (f) \rightarrow Linear

problem (2)

$$x_2 - x_3 = 0 \quad \text{--- (1)}$$

$$x_1 - 3x_2 = -1 \quad \text{--- (2)}$$

$$-x_1 + 3x_2 = 1 \quad \text{--- (3)}$$

أولاً نبدل المعادلتين (1) مع (2)

$$x_1 - 3x_2 = -1$$

$$x_2 - x_3 = 0$$

$$-x_1 + 3x_2 = 1$$

$$(1) + (3)$$

$$x_1 - 3x_3 = -1$$

$$x_2 - x_3 = 0$$

$$3x_2 - 3x_3 = 0$$

$$\rightarrow -3 \times (2) + (3)$$

صايبين القوسين
يعني قسمة
المعادلة

$$\cancel{x_1 - 3x_3} = -1$$

$$x_2 - x_3 = 0$$

$$0 = 0$$

Not

necessary thus we remove it

$$x_1 - 3x_3 = -1$$

$$x_2 - x_3 = 0$$

We choose

$$x_3 = t$$

and because

$$x_2 = x_3$$

$$\Rightarrow x_2 = x_3 = t$$

$$\Rightarrow \begin{cases} x_1 = 3t - 1 \\ x_2 = t \\ x_3 = t \end{cases}$$

Many
Solutions

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Problem 3

$$x_1 - 3x_2 + x_3 = 1$$

$$2x_1 - x_2 - 2x_3 = 2$$

$$x_1 + 2x_2 - 3x_3 = -1$$

Solution

~~$x_1 - 3x_2 + x_3 = 1$~~

~~$2x_1 - x_2 - 2x_3 = 2$~~

~~$x_1 + 2x_2 - 3x_3 = -1$~~

$-2 \times (1) + (3)$

$$x_1 - 3x_2 + x_3 = 1$$

$$5x_2 - 4x_3 = 0$$

$$x_1 + 2x_2 - 3x_3 = -1$$

~~$x_1 + 2x_2 - 3x_3 = -1$~~

$-1 \times (1) + (3)$

$$x_1 - 3x_2 + x_3 = 1$$

$$5x_2 - 4x_3 = 0$$

$$5x_2 - 4x_3 = -2$$

$-1 \times (2) + (3)$

$$x_1 - 3x_2 + x_3 = 1$$

$$5x_2 - 4x_3 = 0$$

False statement $0 = -2$

Therefore

this system has no solution

Problem (4)

$$x - 2y + 3z = 9 \quad \text{--- (1)}$$

$$-x + 3y = -4 \quad \text{--- (2)}$$

$$2x - 5y + 5z = 17 \quad \text{--- (3)}$$

$$\boxed{(1) + (2)}$$

$$x - 2y + 3z = 9$$

$$y + 3z = 5$$

$$\del{2x - 5y + 5z = 17}$$
$$2x - 5y + 5z = 17$$

$$\boxed{-2 \times (1) + (3)}$$

$$x - 2y + 3z = 9$$

$$y + 3z = 5$$

$$-y - z = -1$$

$$\boxed{(2) + (3)}$$

$$x - 2y + 3z = 9$$

$$y + 3z = 5$$

$$2z = 4$$

$$\boxed{\frac{1}{2}X(3)}$$

$$x - 2y + 3z = 9$$

$$y + 3z = 5$$

$$z = 2$$

$$\Rightarrow x = 1$$

$$y = -1$$

$$z = 2$$

problem (5)

problem (2) \longrightarrow consistent (many solutions)

problem (3) \longrightarrow inconsistent (no solution)

problem (4) \longrightarrow consistent (one solution)

problem (6)

$$2x + y = 1 \quad \text{--- (1)}$$

$$x + 2y = -1 \quad \text{--- (2)}$$

$$x - y = 2 \quad \text{--- (3)}$$

إعادة ترتيب المعادلات

$$x + 2y = -1$$

$$2x + y = 1$$

$$x - y = 2$$

$$\boxed{-2x(1) + (2)}$$

$$x + 2y = -1$$

$$-3y = 3$$

$$x - y = 2$$

$$\boxed{-1(1) + 3}$$

$$x + 2y = -1$$

$$-3y = 3$$

$$-3y = 3$$

$$\boxed{-\frac{1}{3}x(3), -\frac{1}{3}x(2)}$$

$$x + 2y = -1$$

$$y = -1$$

$$y = -1$$

$$\rightarrow \boxed{\begin{matrix} x = 1 \\ y = -1 \end{matrix}}$$

problem (7)

$$x + y + z = 1$$

$$x + 2y + 2z = 1$$

$$x - y + z = 3$$

Solution

$$\begin{array}{l} \text{①} \times (-1) \rightarrow -1x(1) + (2) \\ \text{③} \times (-1) \rightarrow -1x(1) + (3) \end{array}$$

$$x + y + z = 1$$

$$y + z = 0$$

$$-2y = 3$$

$$-2x(2) + 3$$

$$x + y + z = 1$$

$$y + z = 0$$

$$2z = 2$$

$$\rightarrow \begin{cases} z = 1 \\ y = -1 \\ x = 1 \end{cases}$$

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