HW.1

## Section 1.1
## Introduction to Systems of Linear Equations

In Exercises 1–6, determine whether the equation is linear in the variables $x$ and $y$.

1. $2x - 3y = 4$ Linear

2. $3x - 4xy = 0$ not Linear

5. $2 \sin x - y = 14$ not linear

6. $(\sin 2)x - y = 14$ Linear

37. $x_1 - x_2 = 0$ ...① (-3)
$3x_1 - 2x_2 = -1$ ...②

$-3x_1 + 3x_2 = 0$ ...①
$3x_1 - 2x_2 = -1$
$x_2 = -1$

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

40. $x_1 - 2x_2 = 0$
$6x_1 + 2x_2 = 0$

$7x_1 = 0$
$x_1 = 0$

$x_1 - 2x_2 = 0$
$0 - 2x_2 = 0$
$x_2 = 0$

**47.** $x + y + z = 6$ ---①

$2x - y + z = 3$ ---②

$3x \quad - z = 0$ ---③

① ②

$$x + y + z = 6$$
$$2x - y + z = 3$$

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

(A) ③

$$3x - z = 0 \quad \dots\to (-1)$$
$$3x + 2z = 9$$

$$-3x + z = 0$$
$$3x + 2z = 9$$

$$3z = 9$$

$$z = \frac{9}{3}$$

$$\boxed{z = 3}$$

نعوض في معادله 3

$3x - z = 0$

$3x - 3 = 0$

$3x = 3$

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

$\boxed{x = 1}$

نعوض في معادله ١

$x + y + z = 6$

$1 + y + 3 = 6$

$y = 6 - 4$

$\boxed{y = 2}$

48. $x + y + z = 2$ ---①

$-x + 3y + 2z = 8$ ---②

$4x + y = 4$ ---③

① ②

$x + y + z = 2$ .... $(-2)$

$-x + 3y + 2z = 8$

حذف z

$-2x - 2y - 2z = -4$

$-x + 3y + 2z = 8$

$-3x + y = 4$ --- (A)

(A) ③

$(4x + y = 4)$ .... $(-1)$

$-3x + y = 4$

$-4x - y = -4$

$-3x + y = 4$

$-7x = 0$

$x = \frac{0}{-7}$

$\boxed{x = 0}$

نعوض في معادله 3

$4x + y = 4$

$4(0) + y = 4$

$\boxed{y = 4}$

نعوض في معادله ١

$x + y + z = 2$

$0 + 4 + z = 2$

$z = 2 - 4$

$\boxed{z = -2}$

**56.**

$$x_1 + 3x_4 = 4 \quad \cdots ①$$
$$2x_2 - x_3 - x_4 = 0 \quad \cdots ②$$
$$3x_2 - 2x_4 = 1 \quad \cdots ③$$
$$2x_1 - x_2 + 4x_3 = 5 \quad \cdots ④$$

① ④

$x_1$ ගැ

$$x_1 + 3x_4 = 4 \quad \cdots (-2)$$
$$2x_1 - x_2 + 4x_3 = 5$$
$$-2x_1 - 6x_4 = -8$$

$$-x_2 + 4x_3 - 6x_4 = -3 \quad \cdots Ⓐ$$

Ⓐ ②

$$2x_2 - x_3 - x_4 = 0$$
$$(-x_2 + 4x_3 - 6x_4 = -3)\,2$$
$$2x_2 - x_3 - x_4 = 0$$
$$-2x_2 + 8x_3 - 12x_4 = -6$$
$$\therefore 7x_3 - 13x_4 = -6 \quad \cdots Ⓑ$$

Ⓐ ③

$$(-x_2 + 4x_3 - 6x_4 = -3)\,3$$
$$3x_2 - 2x_4 = 1$$
$$-3x_2 + 12x_3 - 18x_4 = -9$$
$$12x_3 - 20x_4 = -8$$
$$3x_3 - 5x_4 = -2 \quad \cdots Ⓒ$$

Ⓑ Ⓒ

$$\therefore 7x_3 - 13x_4 = -6 \quad \xrightarrow{-3} \quad -21x_3 + 39x_4 = +18$$
$$3x_3 - 5x_4 = -2 \quad\quad 21x_3 - 35x_4 = -14$$
$$4x_4 = 4$$
$$x_4 = 1$$

5G

نعوض في معادلة 1

$$x_1 + 3(1) = 4$$

$$x_1 = 4 - 3$$

$$\boxed{x_1 = 1}$$

نعوض في معادلة 3

$$3x_2 - 2(1) = 1$$

$$3x_2 = 1 + 2$$

$$x_2 = \frac{3}{3}$$

$$\boxed{x_2 = 1}$$

نعوض في معادلة 2

$$2(1) - x_3 - 1 = 0$$

$$-x_3 = 1 - 2$$

$$-x_3 = -1$$

$$\boxed{x_3 = 1}$$