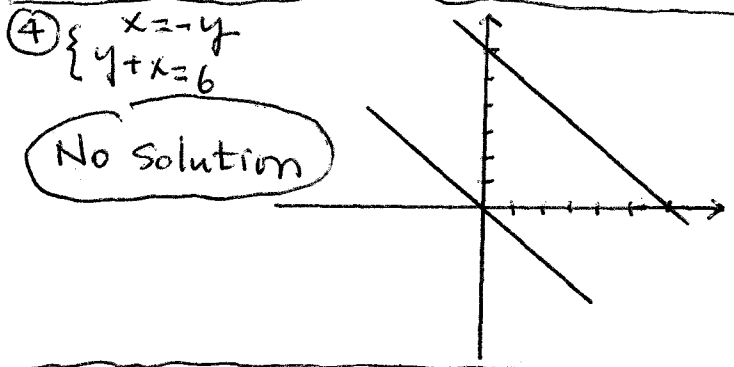
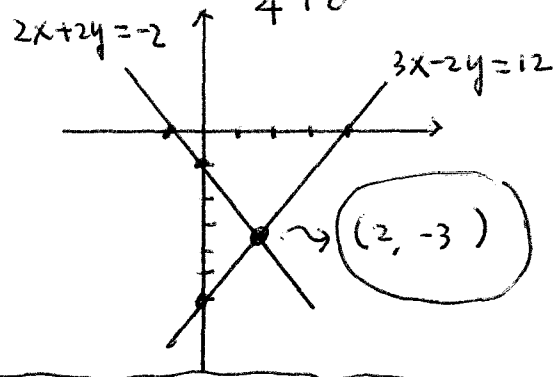


Ch 9

① $(-4, -5)$ $2(-4) + (-5) = -8 - 5 = -13 \neq -3$
 (NO)

② $(-2, 4)$ $2(-2) + 4 = -4 + 4 = 0$
 $4(-2) + 2(4) = -8 + 8 = 0$
 (yes)

③ $\begin{cases} 2x + 2y = -2 \\ 3x - 2y = 12 \end{cases} \rightarrow \begin{array}{r|l} x & y \\ 0 & -1 \\ -1 & 0 \end{array}$



⑤ $\begin{cases} 3x - 5y = 8 \\ 9x - 15y = -36 \end{cases}$ Parallel lines
 (Inconsistent independent)

⑥ $\begin{cases} 2x - 7y = -37 \\ 4x - 14y = -74 \end{cases}$ same line
 (consistent dependent)

⑦ $\begin{cases} 2x + 2y = -2 \\ 5x + 6y = 2 \end{cases}$ one solution
 (consistent independent)

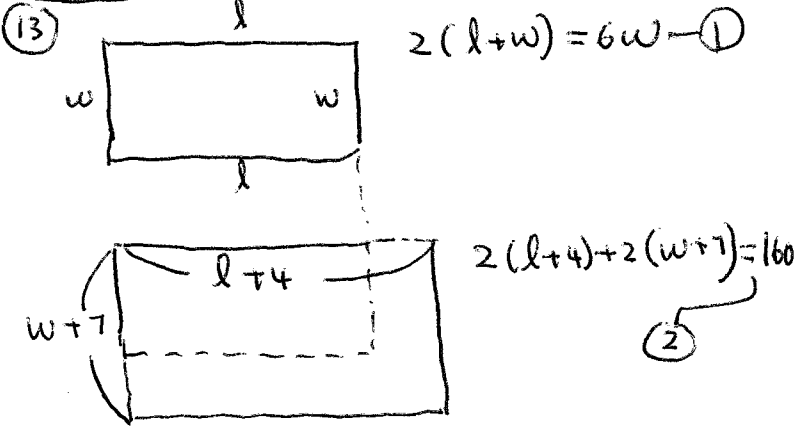
⑧ $\begin{cases} x + 2y = -3 \\ 7x + 3y = -21 \end{cases} \rightarrow x = -2y - 3$
 $7(-2y - 3) + 3y = -21$
 $-14y - 21 + 3y = -21 \Rightarrow -11y = 0 \Rightarrow y = 0$
 $x = 0 - 3 = -3$
 $(-3, 0)$

⑨ $\begin{cases} 2x + 10y = 4 \\ x = -5y + 2 \end{cases} \rightarrow 2(-5y + 2) + 10y = 4$
 $-10y + 4 + 10y = 4$
 $4 = 4$
 Infinite solutions
 $\{(x, y) \mid 2x + 10y = 4 \text{ or } x = -5y + 2\}$

⑩ $x + y = 4 \rightarrow -2x - 2y = -8$
 $2x + 2y = 8 \rightarrow 2x + 2y = 8$ (+)
 $0 = 0$
 Infinite solutions
 $\{(x, y) \mid x + y = 4\}$

⑪ $\begin{cases} x + y = 4 \\ x + y = -7 \end{cases} \Rightarrow$ No solution

⑫ $\begin{cases} x - y = 64 \\ 5x = x \end{cases} \rightarrow 5y - y = 64$
 $4y = 64 \Rightarrow y = 16$
 $x = 5(16) = 80$
 $\{16, 80\}$



From ①, $l + w = 3w \Rightarrow l = 2w$
 " ② $l + w + 22 = 160 \Rightarrow l + w = 138$
 $\Rightarrow 2w + w = 138 \Rightarrow 3w = 138$
 $\Rightarrow w = 46$
 $l = 2 \cdot w = 92$

width = 46
 length = 92

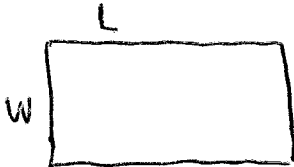
$$\begin{cases} F + M = 276 \\ M = F + 26 \end{cases} \quad \begin{matrix} F = \text{Fern} \\ M = \text{Moss} \end{matrix}$$

$$F + F + 26 = 276 \Rightarrow 2F + 26 = 276$$

$$2F = 250 \Rightarrow F = 125$$

$$M = 125 + 26 = 151$$

15



$$\begin{cases} L = 7 + W & \text{--- ①} \\ 2(L + W) = 82 & \text{--- ②} \end{cases}$$

From ②, $L + W = 41 \Rightarrow 7 + W + 7 = 41$

$$W + 14 = 21 \Rightarrow W = 7, L = 7 + W = 14$$

16 Infinite solutions
(all real numbers)

17

$$\begin{cases} x - 4y = -16 \\ 4x - 3y = -12 \end{cases} \rightarrow \begin{cases} 4x - 16y = -64 \\ 4x - 3y = -12 \end{cases}$$

$$\begin{array}{r} -13y = -52 \\ \underline{-13} \quad \underline{-13} \\ y = 4 \end{array}$$

$$x - 4(4) = -16$$

$$4 - 16 = -16 \Rightarrow x = 0$$

The solution is $(0, 4)$

18

$$\begin{cases} \frac{1}{3}x - \frac{1}{4}y = 1 \Rightarrow 4x - 3y = 12 \\ \frac{2}{3}x + \frac{1}{2}y = 3 \Rightarrow 4x + 3y = 18 \end{cases}$$

$$\begin{array}{r} 4x - 3y = 12 \\ \underline{4x + 3y = 18} \\ 8x = 30 \Rightarrow x = \frac{15}{4} \end{array}$$

$$x(\frac{15}{4}) - 3y = 12$$

$$15 - 3y = 12 \Rightarrow 3 = 3y \Rightarrow y = 1$$

The solution is $(\frac{15}{4}, 1)$

19

$$\begin{cases} 3x + 6y = 12 \\ -3x - y = -7 \end{cases}$$

$$5y = 5 \Rightarrow y = 1$$

~~3x + 6(1) = 12~~

$$-3x - 1 = -7$$

$$-3x = -6 \Rightarrow x = 2$$

The solution is $(2, 1)$

20

$$\begin{cases} x + y = 90 \\ 2x + y = 115 \end{cases} \quad \begin{matrix} x = 25^\circ \\ y = 65^\circ \end{matrix}$$

21

$$\begin{cases} A: 27 + 0.17x \\ B: 18 + 0.2x \end{cases} \quad \text{let } A = B$$

$$27 + 0.17x = 18 + 0.2x$$

$$9 = 0.03x \Rightarrow 900 = 3x \Rightarrow x = 300$$

300 miles

22

$$\begin{cases} x + y = 180 \\ x = 40 + 3y \end{cases} \quad \begin{matrix} 40 + 3y + y = 180 \\ 40 + 4y = 180 \end{matrix}$$

$$\frac{4y}{4} = \frac{180 - 40}{4} = \frac{140}{4} \Rightarrow y = 35^\circ$$

$$x = 40 + 3(35) = 40 + 105 = 145^\circ$$

$\{35^\circ, 145^\circ\}$

23

$$\begin{cases} x + y = 90 \\ x = 54 + 2y \end{cases} \quad \begin{matrix} 54 + 2y + y = 90 \\ 54 + 3y = 90 \end{matrix}$$

$$3y = 90 - 54 = 36 \Rightarrow y = 12$$

$$x = 54 + 2(12) = 54 + 24 = 78$$

$\{78^\circ, 12^\circ\}$

24 check the numbers to the system

25

26

$$\begin{cases} x + y + z = 0 & \text{--- ①} \\ x + y + 4z = 7 & \text{--- ②} \\ 2x + y + z = -4 & \text{--- ③} \end{cases}$$

$$\text{①} + \text{②} \Rightarrow 2x + 5z = 7 \rightarrow \text{④}$$

$$\text{②} + \text{③} \Rightarrow 3x + 5z = 3 \rightarrow \text{⑤}$$

$$\text{④} - \text{⑤} \Rightarrow -x = 4 \Rightarrow x = -4$$

$$-8 + 5z = 7 \Rightarrow 5z = 15 \Rightarrow z = 3$$

$$-4 + y + 3 = 0 \Rightarrow -1 + y = 0 \Rightarrow y = 1$$

The solution is $(-4, 1, 3)$

$$\begin{cases} 2x + 10y + 4z = 42 & \text{--- (1)} \\ x + 5y + 2z = 21 & \text{--- (2)} \\ x + y + z = -2 & \text{--- (3)} \end{cases}$$

$$\text{(2)} \times 2 \Rightarrow -2x + 10y + 4z = -42$$

$$\text{(1)} \Rightarrow \underline{2x + 10y + 4z = -42} \quad (+)$$

$$0 = -84$$

No solution

$$\begin{cases} -2x - 2y + 6z = -2 & \text{--- (1)} \\ 6x + 6y - 18z = 6 & \text{--- (2)} \\ -10x - 10y + 30z = -10 & \text{--- (3)} \end{cases}$$

$$\text{(1)} \times 3 \Rightarrow -6x - 6y + 18z = -6$$

$$\text{(2)} \Rightarrow \underline{6x + 6y - 18z = 6} \quad (+)$$

$$0 = 0$$

Infinite solution

$$\text{(29)} \begin{bmatrix} 3 & 1 & 0 \\ 1 & 2 & 5 \\ 5 & 5 & 3 \end{bmatrix}$$

$$D = 3 \begin{vmatrix} 2 & 5 \\ 5 & 3 \end{vmatrix} - 1 \begin{vmatrix} 1 & 5 \\ 5 & 3 \end{vmatrix} + 0 \begin{vmatrix} 1 & 2 \\ 5 & 5 \end{vmatrix}$$

$$= 3(6 - 25) - 1(3 - 25) + 0(5 - 10)$$

$$= 3(-19) - (-22) + 0$$

$$= -48 + 22 = -26$$

$$\text{(30)} \begin{cases} 6x + 8y = -8 \\ -4x + 4y = -4 \end{cases}$$

$$D = \begin{vmatrix} 6 & 8 \\ -4 & 4 \end{vmatrix} = 24 - (-32) = 56$$

$$D_x = \begin{vmatrix} -8 & 8 \\ -4 & 4 \end{vmatrix} = -32 - (-32) = 0$$

$$D_y = \begin{vmatrix} 6 & -8 \\ -4 & -4 \end{vmatrix} = -24 - (32) = -56$$

$$x = \frac{D_x}{D} = \frac{0}{56} = 0, \quad y = \frac{D_y}{D} = \frac{-56}{56} = -1$$

{0, -1}

$$\text{(31)} \begin{cases} x - y + 4z = 7 \\ 5x + z = 3 \\ x + 2y + z = 13 \end{cases}$$

$$D = \begin{vmatrix} 1 & -1 & 4 \\ 5 & 0 & 1 \\ 1 & 2 & 1 \end{vmatrix} = 1 \begin{vmatrix} 0 & 1 \\ 2 & 1 \end{vmatrix} + 1 \begin{vmatrix} 5 & 1 \\ 1 & 1 \end{vmatrix} + 4 \begin{vmatrix} 5 & 0 \\ 1 & 2 \end{vmatrix}$$

$$= 1(0 - 2) + 1(5 - 1) + 4(10 - 0)$$

$$= -2 + 4 + 40 = 42$$

$$D_x = \begin{vmatrix} 7 & -1 & 4 \\ 3 & 0 & 1 \\ 13 & 2 & 1 \end{vmatrix} = 7 \begin{vmatrix} 0 & 1 \\ 2 & 1 \end{vmatrix} + 1 \begin{vmatrix} 3 & 1 \\ 13 & 1 \end{vmatrix} + 4 \begin{vmatrix} 3 & 0 \\ 13 & 2 \end{vmatrix}$$

$$= 7(0 - 2) + 1(3 - 13) + 4(6 - 0)$$

$$= -14 - 10 + 24 = -24 + 24 = 0$$

$$D_y = \begin{vmatrix} 1 & 7 & 4 \\ 5 & 3 & 1 \\ 1 & 13 & 1 \end{vmatrix} = 1 \begin{vmatrix} 3 & 1 \\ 13 & 1 \end{vmatrix} - 7 \begin{vmatrix} 5 & 1 \\ 1 & 1 \end{vmatrix} + 4 \begin{vmatrix} 5 & 3 \\ 1 & 13 \end{vmatrix}$$

$$= 1(3 - 13) - 7(5 - 1) + 4(65 - 3)$$

$$= -10 - 28 + 248 = 210$$

$$D_z = \begin{vmatrix} 1 & -1 & 7 \\ 5 & 0 & 3 \\ 1 & 2 & 13 \end{vmatrix} = 1 \begin{vmatrix} 0 & 3 \\ 2 & 13 \end{vmatrix} + 1 \begin{vmatrix} 5 & 3 \\ 1 & 13 \end{vmatrix} + 7 \begin{vmatrix} 5 & 0 \\ 1 & 2 \end{vmatrix}$$

$$= 1(0 - 6) + 1(65 - 3) + 7(10 - 0)$$

$$= -6 + 62 + 70 = 126$$

$$x = \frac{D_x}{D} = \frac{0}{42} = 0, \quad y = \frac{D_y}{D} = \frac{210}{42} = 5, \quad z = \frac{D_z}{D} = \frac{126}{42} = 3$$

The solution is (0, 5, 3)

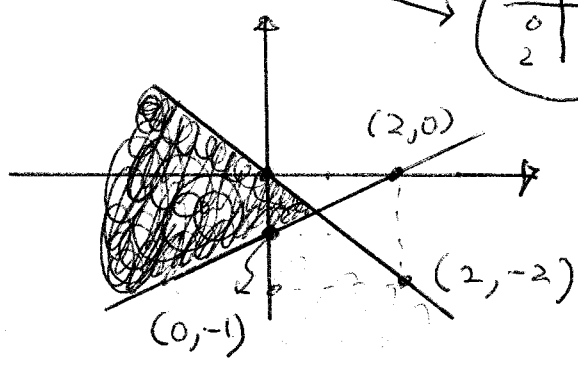
(32) → skip

33

$$\begin{cases} x - 2y \leq 2 \\ x + y \leq 0 \end{cases}$$

x	b
0	-1
2	0

x	b
0	0
2	-2

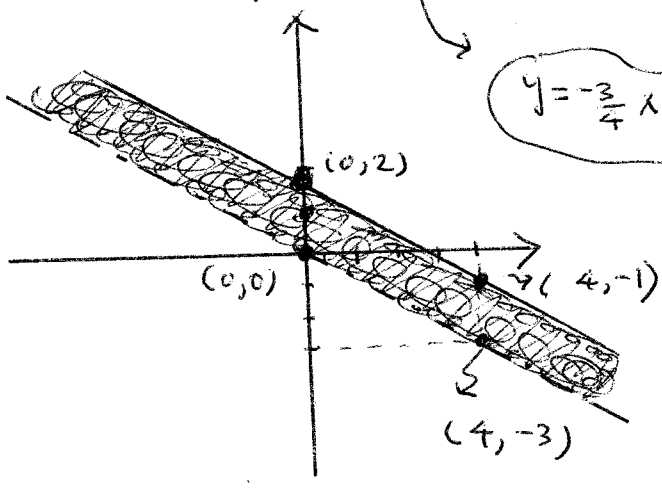


34

$$\begin{cases} 3x > -4y \\ 3x + 4y \leq 8 \end{cases}$$

x	b
0	0
4	-3

$$y = -\frac{3}{4}x + 2$$



35

$$\begin{cases} 2x + 3y \geq 6 \\ x - y \geq 3 \\ y \leq 2 \end{cases}$$

x	b
0	2
3	0

x	b
0	-3
3	0

