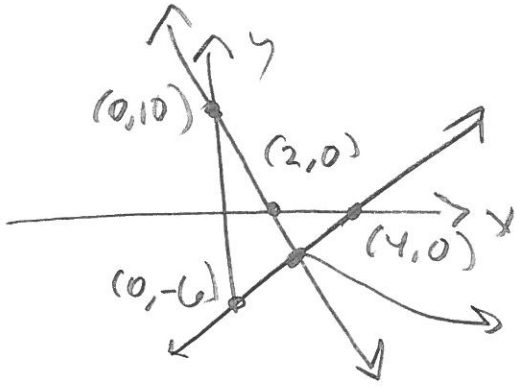
121 WP #4 SPRING, 2019

1 (a) (10 pts)



$3x-2y=12$

x	y
0	-6
4	0

$5x+y=10$

x	y
0	10
2	0

QIV $\approx (3,-3)$?

(1b) (10 pts)

$3x-2y=12$

$5x+y=10 \Rightarrow y=10-5x$

$\Rightarrow 3x-2y=3x-2(10-5x)=3x-20+10x=12$

$\Rightarrow 13x=32 \Rightarrow \boxed{x=\frac{32}{13}} \Rightarrow$

$y=10-5x=10-5\left(\frac{32}{13}\right)=\frac{130-160}{13}=\boxed{-\frac{30}{13}=y}$

(1c)

$3x-2y=12$

$5x+y=10$

$-5E1 \quad -15x+10y=-60$

$3E2 \quad 15x+3y=30$

$-5E1+3E2: \quad 13y=-30$

$\boxed{y=-\frac{30}{13}}$

$\Rightarrow 5x+y=5x-\frac{30}{13}=10$

$\Rightarrow 5x=\frac{130+30}{13}=\frac{160}{13}$

$\Rightarrow x=\frac{1}{5}\left(\frac{160}{13}\right)=\boxed{\frac{32}{13}=x}$

121 WP #4

(2) (10pts)

$$x + 2y + 2z = 7$$
$$-2x + y + 4z = 0$$
$$2y + 3z = 6$$

2E1 $2x + 4y + 4z = 14$

E2 $-2x + y + 4z = 0$

2E1 + E2 $5y + 8z = 14$

New System:

$$x + 2y + 2z = 7$$
$$5y + 8z = 14$$
$$2y + 3z = 6$$

-2E2 $-10y - 16z = -28$

5E3 $10y + 15z = 30$

$-z = 2$

$z = -2$

$2y + 3z = 2y + 3(-2) = 2y - 6 = 6 \longrightarrow$

$2y = 12$

$y = 6$

$x + 2y + 2z = x + 2(6) + 2(-2) = 7$

$x + 12 - 4 = 7$

$x + 8 = 7$

$x = -1$

121 WRAY

Check #2 ✓

$$\begin{bmatrix} 1 & 2 & 2 \\ -2 & 1 & 4 \\ 0 & 2 & 3 \end{bmatrix}\begin{bmatrix} -1 \\ 6 \\ -2 \end{bmatrix} = \begin{bmatrix} -1+12-4 \\ +2+6-8 \\ 0+12-6 \end{bmatrix} = \begin{bmatrix} 7 \\ 0 \\ 6 \end{bmatrix}$$

(3.a) (10 pts)

$$\begin{aligned} x+2y+2z &= 3 \\ 2x-y+7z &= 4 \\ -x+3y-5z &= -1 \end{aligned}$$

$-2E1$ $\quad -2x-4y-4z = -6$

$E2$ $\quad 2x-y+7z = 4$

$-2E1+E2$ $\quad -5y+3z = -2$

$E1$ $\quad x+2y+2z = 3$

$E3$ $\quad -x+3y-5z = -1$

$E1+E3$ $\quad 5y-3z = 2$

$E2+E3 = 0$!

NEW SYSTEM:

$$\begin{aligned} x+2y+2z &= 3 \\ -5y+3z &= -2 \\ 5y-3z &= 2 \end{aligned}$$

Cancel. ∴ so

$$\begin{aligned} x+2y+2z &= 3 \\ 5y-3z &= 2 \end{aligned}$$

3 system, so

$$5y = 3z+2 \Rightarrow y = \frac{3}{5}z+\frac{2}{5} \longrightarrow$$

$$x+2\left(\frac{3}{5}z+\frac{2}{5}\right)+2z = 3$$

$$x+\frac{6}{5}z+\frac{4}{5}+\frac{10}{5}z = \frac{15}{5}$$

$$x = \frac{15-4}{5}-\frac{16}{5}z = \frac{-16}{5}z+\frac{11}{5} = x$$

$$\left\{(x,y,z) \;\middle|\; x=-\tfrac{16}{5}z+\tfrac{11}{5},\ y=\tfrac{3}{5}z+\tfrac{2}{5},\ z=\text{ANY}\right\}$$

121 ~~#3~~ WP3

(3b) (10 pts) $z=0 \Rightarrow \boxed{(x,y,z)=\left(\frac{11}{5},\frac{2}{5},0\right)}$

$z=1 \Rightarrow x=-\frac{16}{5}(1)+\frac{11}{5}=\frac{-16+11}{5}=-\frac{5}{5}=-1=x$

& $y=\frac{3}{5}(1)+\frac{2}{5}=\frac{5}{5}=1=y$

$\Rightarrow \boxed{(x,y,z)=(-1,1,1)}$

$z=-1 \Rightarrow x=-\frac{16}{5}(-1)+\frac{11}{5}=\frac{16+11}{5}=\frac{27}{5}=x$

& $y=\frac{3}{5}(-1)+\frac{2}{5}=\frac{-3+2}{5}=-\frac{1}{5}=y \Rightarrow$

$\boxed{(x,y,z)=\left(\frac{27}{5},-\frac{1}{5},-1\right)}$

121 WP #4

(4) 10 pts

$$x + 2y + 2z = 3$$
$$2x - y + 7z = 4$$
$$-x + 3y - 5z = 0$$

$-2E1$ $\quad -2x - 4y - 4z = -6$
$E2$ $\quad 2x - y + 7z = 4$
$-2E1 + E2$ $\quad -5y + 3z = -2$

$E1$ $\quad x + 2y + 2z = 3$
$E3$ $\quad -x + 3y - 5z = 0$
$E1 + E3$ $\quad 5y - 3z = 3$

NEW SYSTEM:

$$x + 2y + 2z = 3$$
$$-5y + 3z = -2$$
$$5y - 3z = 3$$

$E2$ $\quad -5y + 3z = -2$
$E3$ $\quad 5y - 3z = 3$
$E2 + E3$ $\quad 0 = 1$?! Absurd! $\Longrightarrow$

$\nexists$ soln.