

PC Review Sheet for Exam 1 Q3

* Answers to Monday's hw are attached at the end *

①

① rows by columns so 2×4 (B)

② $2x + y = 3$ (A)
 $3x + 2y = 1$

③ $\begin{bmatrix} 1 & 0 & 3 \\ 0 & 2 & 4 \end{bmatrix} \xrightarrow{\frac{1}{2}R_2} \begin{bmatrix} 1 & 0 & 3 \\ 0 & 1 & 2 \end{bmatrix} \quad \begin{matrix} y = 2 \\ x = 3 \end{matrix} \quad (3, 2) \quad (C)$

④ 3×2

⑤ $\begin{bmatrix} 2 & 3 & 4 \\ -3 & -4 & 5 \end{bmatrix}$

⑥ $\begin{bmatrix} 2 & -1 & 1 & 6 \\ -1 & 2 & 1 & 0 \\ 1 & 1 & -1 & -3 \end{bmatrix} \xrightarrow{R_1, R_3} \begin{bmatrix} 1 & 1 & -1 & -3 \\ -1 & 2 & 1 & 0 \\ 2 & -1 & 1 & 6 \end{bmatrix} \xrightarrow{R_1 + R_2} \begin{bmatrix} 1 & 1 & -1 & -3 \\ 0 & 3 & 0 & -3 \\ 2 & -1 & 1 & 6 \end{bmatrix}$

$\xrightarrow{\frac{1}{3}R_2} \begin{bmatrix} 1 & 1 & -1 & -3 \\ 0 & 1 & 0 & -1 \\ 2 & -1 & 1 & 6 \end{bmatrix} \xrightarrow{-2R_1 + R_3} \begin{bmatrix} 1 & 1 & -1 & -3 \\ 0 & 1 & 0 & -1 \\ 0 & -3 & 3 & 12 \end{bmatrix} \xrightarrow{\frac{1}{3}R_3} \begin{bmatrix} 1 & 1 & -1 & -3 \\ 0 & 1 & 0 & -1 \\ 0 & -1 & 1 & 4 \end{bmatrix}$

$\xrightarrow{R_2 + R_3} \begin{bmatrix} 1 & 1 & -1 & -3 \\ 0 & 1 & 0 & -1 \\ 0 & 0 & 1 & 3 \end{bmatrix} \quad \begin{matrix} z = 3 \\ y = -1 \end{matrix} \quad \begin{matrix} x + y - z = -3 \\ x - 1 - 3 = -3 \\ x - 4 = -3 \end{matrix} \quad (1, -1, 3)$
 $\boxed{x = 1}$

⑦

- ① $x + 3y + z = 3$
- ② $x + 5y + 5z = 1$
- ③ $2x + 6y + 3z = 8$

$$x + 3y + z = 3$$

$$x + 3(-5) + z = 3$$

$$x - 15 + z = 3$$

$$x - 13 = 3$$

$$\boxed{x = 16}$$

1+2 eliminate x

$$-1(x + 3y + z = 3)$$

$$x + 5y + 5z = 1$$

$$-x - 3y - z = -3$$

$$x + 5y + 5z = 1$$

$$2y + 4z = -2 \quad \text{④}$$

1+3 eliminate x

$$-2(x + 3y + z = 3)$$

$$2x + 6y + 3z = 8$$

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

$$2x + 6y + 3z = 8$$

$$\boxed{z = 2}$$

$$2y + 4z = -2$$

$$2y + 4(2) = -2$$

$$2y + 8 = -2$$

$$2y = -10$$

$$\boxed{y = -5}$$

$$\boxed{(16, -5, 2)}$$

$$\begin{cases} x - 3z = -2 \\ 3x + y - 2z = 5 \\ 2x + 2y + z = 4 \end{cases}$$

$$\left[\begin{array}{ccc|c} 1 & 0 & -3 & -2 \\ 3 & 1 & -2 & 5 \\ 2 & 2 & 1 & 4 \end{array} \right] \begin{array}{l} -3R_1 + R_2 \\ -3R_1 + R_3 \end{array} \left[\begin{array}{ccc|c} 1 & 0 & -3 & -2 \\ 0 & 1 & 7 & 11 \\ 2 & 2 & 1 & 4 \end{array} \right]$$

$$\begin{array}{l} -2R_1 + R_3 \\ -2R_1 [-2 \ 0 \ 6 \ 4] \end{array} \left[\begin{array}{ccc|c} 1 & 0 & -3 & -2 \\ 0 & 1 & 7 & 11 \\ 0 & 2 & 7 & 8 \end{array} \right] \begin{array}{l} -2R_2 + R_3 \\ -2R_2 [0 \ -2 \ -14 \ -22] \end{array} \left[\begin{array}{ccc|c} 1 & 0 & -3 & -2 \\ 0 & 1 & 7 & 11 \\ 0 & 0 & -7 & -14 \end{array} \right] \begin{array}{l} \frac{1}{7}R_3 \end{array}$$

$$\left[\begin{array}{ccc|c} 1 & 0 & -3 & -2 \\ 0 & 1 & 7 & 11 \\ 0 & 0 & 1 & 2 \end{array} \right]$$

$$\boxed{z = 2}$$

$$y + 7z = 11$$

$$y + 7(2) = 11$$

$$y + 14 = 11$$

$$\boxed{y = -3}$$

$$\boxed{(4, -3, 2)}$$

$$x - 3z = -2$$

$$x - 3(2) = -2$$

$$x - 6 = -2$$

$$\boxed{x = 4}$$

(4)

$$\begin{aligned} \textcircled{9} \quad x - 2y + 3z &= 9 \\ -x + 3y &= -4 \\ 2x - 5y + 5z &= 17 \end{aligned}$$

$$\left[\begin{array}{ccc|c} 1 & -2 & 3 & 9 \\ -1 & 3 & 0 & -4 \\ 2 & -5 & 5 & 17 \end{array} \right] \xrightarrow{R_1+R_2} \left[\begin{array}{ccc|c} 1 & -2 & 3 & 9 \\ 0 & 1 & 3 & 5 \\ -2 & -5 & 5 & 17 \end{array} \right]$$

$$\begin{array}{l} -2R_1 + R_3 \\ 2R_1 \end{array} \left[\begin{array}{ccc|c} -2 & 4 & -6 & -18 \end{array} \right] \left[\begin{array}{ccc|c} 1 & -2 & 3 & 9 \\ 0 & 1 & 3 & 5 \\ 0 & -1 & -1 & -1 \end{array} \right] \xrightarrow{R_2+R_3}$$

$$\left[\begin{array}{ccc|c} 1 & -2 & 3 & 9 \\ 0 & 1 & 3 & 5 \\ 0 & 0 & 2 & 4 \end{array} \right] \xrightarrow{\frac{1}{2}R_3} \left[\begin{array}{ccc|c} 1 & -2 & 3 & 9 \\ 0 & 1 & 3 & 5 \\ 0 & 0 & 1 & 2 \end{array} \right]$$

$$\boxed{z = 2}$$

$$\begin{aligned} y + 3z &= 5 \\ y + 3(2) &= 5 \\ y + 6 &= 5 \\ \boxed{y} &= -1 \end{aligned}$$

$$\begin{aligned} x - 2y + 3z &= 9 \\ x - 2(-1) + 3(2) &= 9 \\ x + 2 + 6 &= 9 \\ x + 8 &= 9 \\ \boxed{x} &= 1 \end{aligned}$$

$$\boxed{(1, -1, 2)}$$

(10)

$$(a) \begin{array}{l} 7x - 2y = 14 \\ -3y + 7x = 21 \end{array} \rightarrow \begin{array}{l} 7x - 2y = 14 \\ -1(7x - 3y = 21) \end{array}$$

$$\begin{array}{l} 7x - 2y = 14 \\ -7x + 3y = -21 \end{array}$$

$$y = -7$$

$$7x - 2y = 14$$

$$7x - 2(-7) = 14$$

$$7x + 14 = 14$$

$$7x = 0$$

$$x = 0$$

$$(0, -7)$$

$$(b) \begin{array}{l} -4x + 5y = 14 \\ 4x - 3y = -8 \end{array}$$

$$\begin{array}{l} 2y = 6 \\ y = 3 \end{array}$$

$$-4x + 5y = 14$$

$$-4x + 5(3) = 14$$

$$-4x + 15 = 14$$

$$-4x = -1$$

$$x = 1/4$$

$$(1/4, 3)$$

$$(c) -a - 4b = -93$$

$$a + 4b = 43$$

$$0 = -50$$

no solution

$$(d) \begin{cases} 8x + 12y = 48 \\ 6x + 9y = 36 \end{cases}$$

$$24x + 36y = 144$$

$$-24x - 36y = -144$$

$$0 = 0$$

infinite solutions

in terms of x $(x, -\frac{2}{3}x + 4)$ ← need y in terms of x

$$8x + 12y = 48$$

$$12y = -8x + 48$$

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

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

general solution:

in terms of y $(-\frac{3}{2}y + 6, y)$

↑
need x in terms of y

$$8x + 12y = 48$$

$$8x = -12y + 48$$

$$x = -\frac{12}{8}y + \frac{48}{8} = -\frac{3}{2}y + 6$$

(6)

(e) $4x - 5y = -6$
 $-4(x - 3y = 2)$

$4x - 5y = -6$
 $-4x + 12y = -8$
 $7y = -14$
 $y = -2$

$4x - 5y = -6$
 $4x - 5(-2) = -6$
 $4x + 10 = -6$ | $(-4, -2)$
 $4x = -16$
 $x = -4$

(d)

(a) $G = \left[\begin{array}{ccc|c} 1 & -2 & 1 & 7 \\ 3 & 1 & -1 & 2 \\ 2 & 3 & 2 & 7 \end{array} \right]$
 $-3R_1 + R_2$
 $-3R_1 [-3 \ 6 \ -3 \ -21]$

(b) $H = \left[\begin{array}{ccc|c} 1 & -2 & 1 & 7 \\ 0 & 7 & -4 & -19 \\ 2 & 3 & 2 & 7 \end{array} \right]$

(c) $J = \left[\begin{array}{ccc|c} 1 & -2 & 1 & 7 \\ 0 & 7 & -4 & -19 \\ 0 & 7 & 0 & -7 \end{array} \right]$
 $-2R_1 + R_3$
 $2R_1$
 $[-2 \ 4 \ -2 \ -14]$

(d) $K = \left[\begin{array}{ccc|c} 1 & -2 & 1 & 7 \\ 0 & 7 & -4 & -19 \\ 0 & 0 & 4 & 12 \end{array} \right]$
 $-R_2 + R_3$
 $-R_2$
 $[0 \ -7 \ 4 \ 19]$

(e) $L = \left[\begin{array}{ccc|c} 1 & -2 & 1 & 7 \\ 0 & 7 & 0 & -7 \\ 0 & 0 & 4 & 12 \end{array} \right]$
 $3 + R_2$

(f) $P = \left[\begin{array}{ccc|c} 1 & -2 & 1 & 7 \\ 0 & 1 & 0 & -1 \\ 0 & 0 & 4 & 12 \end{array} \right]$
 $\frac{1}{7}R_2$

(g) $Q = \left[\begin{array}{ccc|c} 1 & -2 & 1 & 7 \\ 0 & 1 & 0 & -1 \\ 0 & 0 & 1 & 3 \end{array} \right]$
 $\frac{1}{4}R_3$

(h) $z = 3$
 $y = -1$
 $(2, -1, 3)$

$x - 2y + z = 7$
 $x - 2(-1) + 3 = 7$
 $x + 2 + 3 = 7$
 $x + 5 = 7$
 $x = 2$

$$(2) (a) \quad \frac{x}{x-2} - \frac{7}{x+3} = \frac{10}{x^2+x-6}$$

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

$$x^2 + 3x - 8x + 16 = 10$$

$$x^2 - 5x + 6 = 0$$

$$(x-3)(x-2) = 0$$

$$\boxed{x=3} \quad | \quad x=2$$

reject

$$(b) \quad \frac{9}{x} + \frac{9}{x-2} = 12$$

$x(x-2)$ $x(x-2)$ $x(x-2)$

$$9x - 18 + 9x = 12x^2 - 24x$$

$$18x - 18 = 12x^2 - 24x$$

$$0 = 12x^2 - 42x + 18$$

$$0 = 6(2x^2 - 7x + 3)$$

$$0 = 6(2x^2 - 6x - x + 3)$$

$$0 = 6(2x(x-3) - 1(x-3))$$

$$0 = 6(2x-1)(x-3)$$

$$\boxed{x = \frac{1}{2} \quad | \quad x = 3}$$

$$(c) \quad \frac{4}{x-1} = \frac{5}{2x-2} + \frac{3x}{4}$$

$4(x-1)$ $4(x-1)$ $4(x-1)$

$$16 = 10 + 3x^2 - 3x$$

$$0 = 3x^2 - 3x - 6$$

$$0 = 3(x^2 - x - 2)$$

$$0 = 3(x-2)(x+1)$$

$$0 = 3(x-2)(x+1)$$

$$\boxed{x=2 \quad | \quad x=-1}$$

$$(d) \frac{1}{2a} - \frac{9}{\frac{a^2+6a}{a(a+6)}} = \frac{2-a}{\frac{2a+12}{2(a+6)}}$$

$$a+6 - 18 = 2a - a^2$$

$$a^2 - a - 12 = 0$$

$$(a-4)(a+3) = 0$$

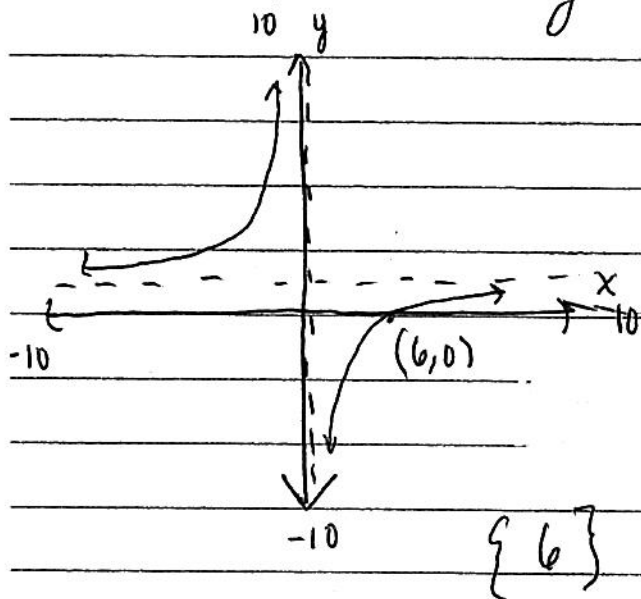
$$\boxed{a=4 \mid a=-3}$$

$$(13) (a) \frac{x-2}{x} = \frac{x+2}{2x}$$

$$\frac{x-2}{x} - \frac{x+2}{2x} = 0$$

possible vertical asymptotes: $x=0$

end behavior: $y = 1 - \frac{1}{2} = +\frac{1}{2}$



{6}

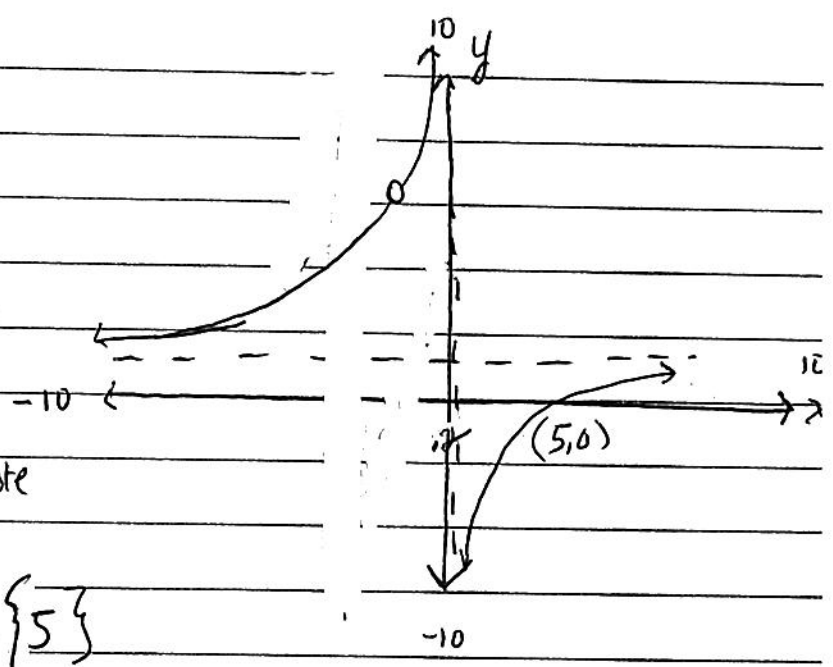
$$(b) \frac{x}{x+2} = \frac{3}{x} + \frac{4}{x^2+2x}$$

$$\frac{x}{x+2} - \frac{3}{x} - \frac{4}{x(x+2)} = 0$$

pVA $x=0, -2$ hole here not an asymptote

$$EB: y = 1 - 0 - 0 = 1$$

{5}



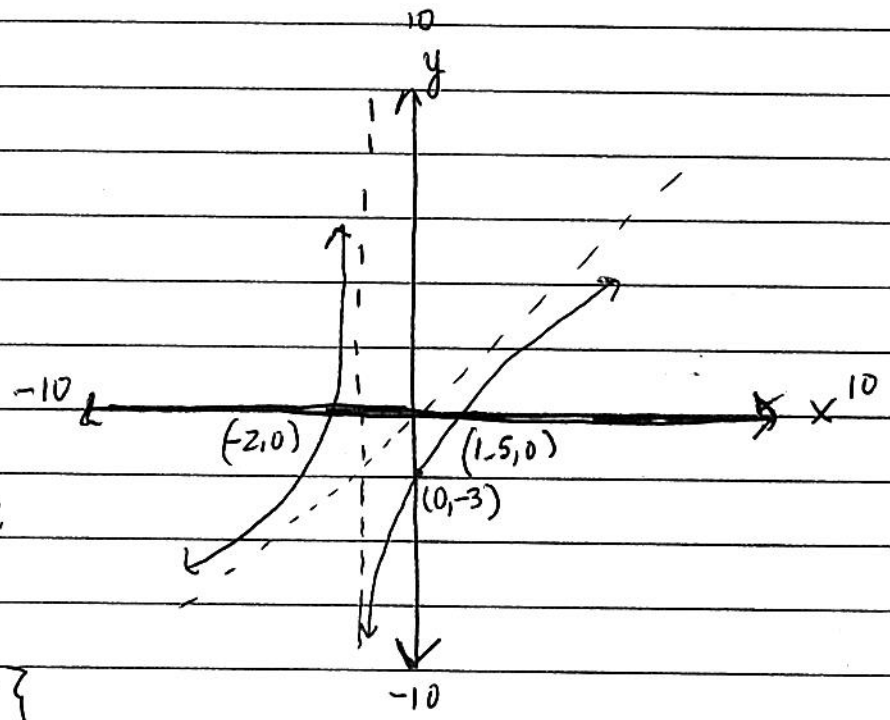
$$(c) \frac{x}{2} = \frac{3}{2x+1}$$

$$\frac{x}{2} - \frac{3}{2x+1} = 0$$

pVA $x = -\frac{1}{2}$

$$EB: y = \frac{1}{2}x - 0 = \frac{1}{2}x$$

{-2, 1.5}



$$(14) \quad x-1 \geq \frac{8}{x+3}$$

$$(a) \quad \frac{x-1}{4} \geq \frac{8}{x+3}$$

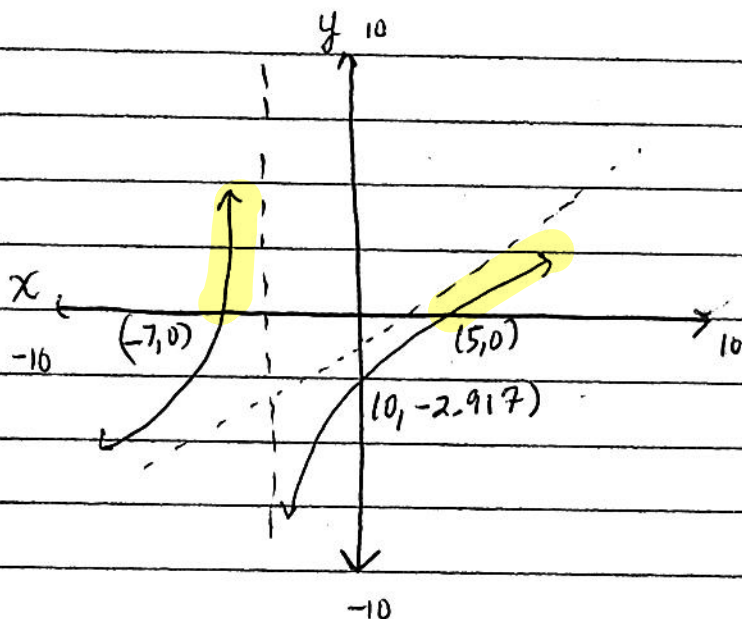
$$\frac{x-1}{4} - \frac{8}{x+3} \geq 0$$

$$\text{PVA } x = -3$$

$$\text{EB } y = \frac{1}{4}x - \frac{1}{4} - 0 = \frac{1}{4}x - \frac{1}{4}$$

$$\text{IN } [-7, -3) \cup [5, \infty)$$

$$\text{SB } \{x \mid -7 \leq x < -3 \vee x \geq 5\}$$



$$(b) \quad \frac{x-3}{x+2} < 8$$

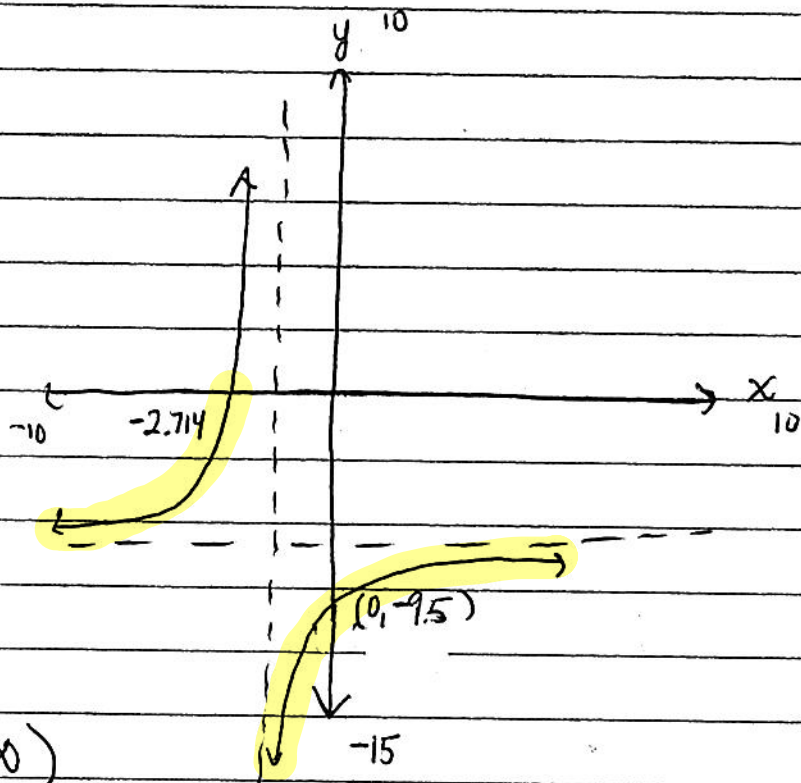
$$\frac{x-3}{x+2} - 8 < 0$$

$$\text{PVA: } x = -2$$

$$\text{EB: } y = 1 - 8 = -7$$

$$\text{IN } (-\infty, -2.714) \cup (-2, \infty)$$

$$\text{SB } \{x \mid x < -2.714 \vee x > -2\}$$

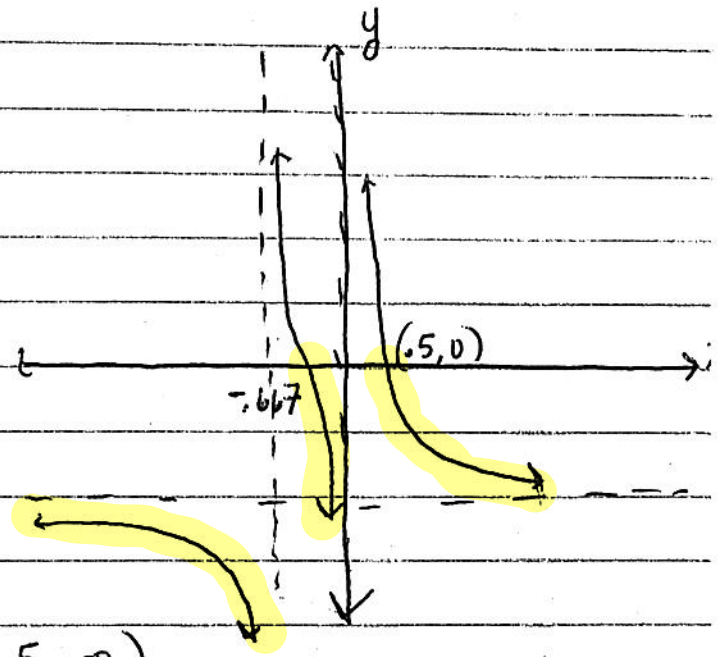


$$(c) \quad \frac{3}{x+1} + \frac{2}{x} < 6$$

$$\frac{3}{x+1} + \frac{2}{x} - 6 < 0$$

$$\text{PVA: } x=0, -1$$

$$\text{EB: } y = 0 + 0 - 6 = -6$$



$$\text{IV } (-\infty, -1) \cup (-.667, 0) \cup (.5, \infty)$$

$$\text{SB } \{x \mid x < -1 \vee -.667 < x < 0 \vee x > .5\}$$

Homework 02-12

$$15. \begin{cases} x - 2y + z = 1 \\ y + 2z = 5 \\ x + y + 3z = 8 \end{cases}$$

$$\left[\begin{array}{ccc|c} 1 & -2 & 1 & 1 \\ 0 & 1 & 2 & 5 \\ 1 & 1 & 3 & 8 \end{array} \right] \begin{array}{l} -R_1 + R_3 \\ -R_1 [-1 \ 2 \ -1 \ -1] \end{array}$$

$$\left[\begin{array}{ccc|c} 1 & -2 & 1 & 1 \\ 0 & 1 & 2 & 5 \\ 0 & 3 & 2 & 7 \end{array} \right] \begin{array}{l} -3R_2 + R_3 \\ -3R_2 [0 \ -3 \ -6 \ -15] \end{array}$$

$$\left[\begin{array}{ccc|c} 1 & -2 & 1 & 1 \\ 0 & 1 & 2 & 5 \\ 0 & 0 & -4 & -8 \end{array} \right] -\frac{1}{4}R_3$$

$$\left[\begin{array}{ccc|c} 1 & -2 & 1 & 1 \\ 0 & 1 & 2 & 5 \\ 0 & 0 & 1 & 2 \end{array} \right] \begin{array}{l} z = 2 \\ y + 2z = 5 \\ y + 2(2) = 5 \\ y = 1 \end{array}$$

$$(1, 1, 2) \quad \begin{array}{l} x - 2y + z = 1 \\ x - 2(1) + 2 = 1 \\ x = 1 \end{array}$$

$$16. \begin{cases} x + y + 6z = 3 \\ x + y + 3z = 3 \\ x + 2y + 4z = 7 \end{cases}$$

$$\left[\begin{array}{ccc|c} 1 & 1 & 6 & 3 \\ 1 & 1 & 3 & 3 \\ 1 & 2 & 4 & 7 \end{array} \right] \begin{array}{l} -R_1 + R_2 \\ -R_1[-1 -1 -6 -3] \end{array}$$

$$\left[\begin{array}{ccc|c} 1 & 1 & 6 & 3 \\ 0 & 0 & -3 & 0 \\ 1 & 2 & 4 & 7 \end{array} \right] \begin{array}{l} -\frac{1}{3}R_2 \rightarrow R_3 \end{array}$$

$$\left[\begin{array}{ccc|c} 1 & 1 & 6 & 3 \\ 1 & 2 & 4 & 7 \\ 0 & 0 & 1 & 0 \end{array} \right] \begin{array}{l} -R_1 + R_2 \\ -R_1[-1 -1 -6 -3] \end{array}$$

$$\left[\begin{array}{ccc|c} 1 & 1 & 6 & 3 \\ 0 & 1 & -2 & 4 \\ 0 & 0 & 1 & 0 \end{array} \right] \begin{array}{l} z = 0 \\ y - 2z = 4 \\ y - 2(0) = 4 \\ y = 4 \end{array}$$

$$(-1, 4, 0) \quad \begin{array}{l} x + y + 6z = 3 \\ x + 4 + 6(0) = 3 \\ x + 4 = 3 \\ x = -1 \end{array}$$

$$17. \begin{cases} x + y + z = 2 \\ 2x - 3y + 2z = 4 \\ 4x + y - 3z = 1 \end{cases}$$

$$\left[\begin{array}{ccc|c} 1 & 1 & 1 & 2 \\ 2 & -3 & 2 & 4 \\ 4 & 1 & -3 & 1 \end{array} \right] \begin{array}{l} -2R_1 + R_2 \\ -2R_1[-2 \ -2 \ -2 \ -4] \end{array}$$

$$\left[\begin{array}{ccc|c} 1 & 1 & 1 & 2 \\ 0 & -5 & 0 & 0 \\ 4 & 1 & -3 & 1 \end{array} \right] -\frac{1}{5}R_2$$

$$\left[\begin{array}{ccc|c} 1 & 1 & 1 & 2 \\ 0 & 1 & 0 & 0 \\ 4 & 1 & -3 & 1 \end{array} \right] \begin{array}{l} -4R_1 + R_3 \\ -4R_1[-4 \ -4 \ -4 \ -8] \end{array}$$

$$\left[\begin{array}{ccc|c} 1 & 1 & 1 & 2 \\ 0 & 1 & 0 & 0 \\ 0 & -3 & -7 & -7 \end{array} \right] \begin{array}{l} +3R_2 + R_3 \\ 3R_2[0 \ 3 \ 0 \ 0] \end{array}$$

$$\left[\begin{array}{ccc|c} 1 & 1 & 1 & 2 \\ 0 & 1 & 0 & 0 \\ 0 & 0 & -7 & -7 \end{array} \right] -\frac{1}{7}R_3$$

$$\left[\begin{array}{ccc|c} 1 & 1 & 1 & 2 \\ 0 & 1 & 0 & 0 \\ 0 & 0 & 1 & 1 \end{array} \right] \begin{array}{l} z = 1 \\ y = 0 \\ x + y + z = 2 \\ x + 0 + 1 = 2 \\ x + 1 = 2 \\ x = 1 \end{array}$$

$$(1, 0, 1)$$

$$18. \begin{cases} x + y + z = 4 \\ -x + 2y + 3z = 17 \\ 2x - y = -7 \end{cases}$$

$$\begin{bmatrix} 1 & 1 & 1 & | & 4 \\ -1 & 2 & 3 & | & 17 \\ 2 & -1 & 0 & | & -7 \end{bmatrix} \xrightarrow{R_1+R_2} \begin{bmatrix} 1 & 1 & 1 & | & 4 \\ 0 & 3 & 4 & | & 21 \\ 2 & -1 & 0 & | & -7 \end{bmatrix}$$

$$\begin{matrix} -2R_1 + R_3 \\ -2R_1[-2 \ -2 \ -2 \ -8] \end{matrix} \begin{bmatrix} 1 & 1 & 1 & | & 4 \\ 0 & 3 & 4 & | & 21 \\ 0 & -3 & -2 & | & -15 \end{bmatrix}$$

$$R_2+R_3 \begin{bmatrix} 1 & 1 & 1 & | & 4 \\ 0 & 3 & 4 & | & 21 \\ 0 & 0 & 2 & | & 6 \end{bmatrix} \xrightarrow{\frac{1}{2}R_3} \begin{bmatrix} 1 & 1 & 1 & | & 4 \\ 0 & 3 & 4 & | & 21 \\ 0 & 0 & 1 & | & 3 \end{bmatrix} \quad (-2, 3, 3)$$

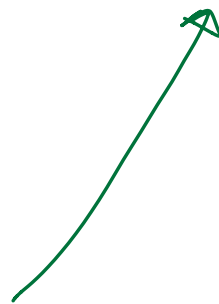
$$\begin{aligned} z &= 3 \\ 3y + 4z &= 21 \\ 3y + 4(3) &= 21 \\ 3y + 12 &= 21 \\ 3y &= 9 \\ y &= 3 \end{aligned}$$

$$\begin{aligned} x + y + z &= 4 \\ x + 3 + 3 &= 4 \\ x + 6 &= 4 \\ x &= -2 \end{aligned}$$

row echelon OR

$$\frac{1}{3}R_2 \begin{bmatrix} 1 & 1 & 1 & | & 4 \\ 0 & 1 & \frac{4}{3} & | & 7 \\ 0 & 0 & 1 & | & 3 \end{bmatrix}$$

$$\begin{aligned} z &= 3 \\ y + \frac{4}{3}z &= 7 \\ y + \frac{4}{3}(3) &= 7 \\ y &= 3 \end{aligned}$$



$$19. \begin{cases} x + 2y - z = -2 \\ x + z = 0 \\ 2x - y - z = -3 \end{cases}$$

$$\left[\begin{array}{ccc|c} 1 & 2 & -1 & -2 \\ 1 & 0 & 1 & 0 \\ 2 & -1 & -1 & -3 \end{array} \right] \begin{array}{l} -R_1 + R_2 \\ -R_1 [-1 \ -2 \ 1 \ 2] \end{array}$$

$$\left[\begin{array}{ccc|c} 1 & 2 & -1 & -2 \\ 0 & -2 & 2 & 2 \\ 2 & -1 & -1 & -3 \end{array} \right] -\frac{1}{2}R_2$$

$$\left[\begin{array}{ccc|c} 1 & 2 & -1 & -2 \\ 0 & 1 & -1 & -1 \\ 2 & -1 & -1 & -3 \end{array} \right] \begin{array}{l} -2R_1 + R_3 \\ -2R_2 [-2 \ -4 \ 2 \ 4] \end{array}$$

$$\left[\begin{array}{ccc|c} 1 & 2 & -1 & -2 \\ 0 & 1 & -1 & -1 \\ 0 & -5 & 1 & 1 \end{array} \right] \begin{array}{l} 5R_2 + R_3 \\ 5R_2 [0 \ 5 \ -5 \ -5] \end{array}$$

$$\left[\begin{array}{ccc|c} 1 & 2 & -1 & -2 \\ 0 & 1 & -1 & -1 \\ 0 & 0 & -4 & -4 \end{array} \right] -\frac{1}{4}R_3 \quad \left[\begin{array}{ccc|c} 1 & 2 & -1 & -2 \\ 0 & 1 & -1 & -1 \\ 0 & 0 & 1 & 1 \end{array} \right]$$

$$z = 1$$

$$y - z = -1$$

$$y - 1 = -1$$

$$y = 0$$

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

$$x + 2(0) - 1 = -2$$

$$x - 1 = -2$$

$$x = -1$$

$$(-1, 0, 1)$$