

①

NC Quiz

D₁(i) Solve by back substitution

$$\begin{aligned} 3x_1 + 3x_2 + x_3 &= 12 \\ -4x_2 - 3x_3 &= -10 \\ 2x_3 &= 4 \end{aligned}$$

$$A = 9$$

$$2x_3 = 9$$

$$x_3 = \frac{9}{2}$$

$$-4x^2 - 3x_3 = -10$$

$$-4x^2 - 3\left(\frac{9}{2}\right) = -10$$

$$-4x^2 - 13.5 = -10$$

$$-4x^2 = -10 + 13.5$$

$$-4x^2 = 3.5$$

$$x^2 = \frac{3.5}{-4}$$

$$x^2 = -0.0875$$

$$3x_1 + 3x_2 + x_3 = 12$$

$$3x_1 + 3(-0.0875) + 4.5 = 12$$

$$3x_1 + (-0.2625) = 12 - 4.5$$

$$3x_1 - 0.2625 = 7.5$$

$$3x_1 = 7.5 + 0.2625$$

$$3x_1 = 7.7625$$

(2)

$$x_1 = \frac{7.7625}{3}$$

$$\boxed{x_1 = 2.5875}$$

①ii Solve by forward substitution

$$3x_1 = A$$

$$3x_2 - x_2 = 10$$

$$5x_1 + x_2 - 2x_3 = 05$$

$$A = 9$$

$$3x_1 = 9$$

$$x_1 = \frac{9}{3}$$

$$\boxed{x_1 = 3}$$

$$3x_2 - x_2 = 10$$

$$-x_2 = 10 - 3x_2$$

$$-x_2 = -2x_2$$

$$x_2 = \frac{-2x_2}{-1}$$

$$\boxed{x_2 = 22}$$

$$5x_1 + x_2 - 2x_3 = 05$$

$$5(3) + (22) - 2x_3 = 5$$

$$15 + 22 - 2x_3 = 5$$

$$37 - 2x_3 = 5$$

(3)

$$\begin{aligned}-2x^3 &= 5 - 37 \\ +2x^3 &= +32 \\ x^3 &= \frac{32}{2}\end{aligned}$$

$$x_3 = 16$$

Q2. Solve the following : A = G

$$\begin{bmatrix} 3 & 1 & -4 & 9 \\ -2 & 3 & 1 & -9 \\ 2 & 0 & 5 & 10 \end{bmatrix}$$

$$\begin{bmatrix} a_{11} & a_{12} & a_{13} \\ a_{21} & a_{22} & a_{23} \\ a_{31} & a_{32} & a_{33} \end{bmatrix}$$

Divide R₁ by 3 R₁/R₃

$$\begin{bmatrix} 1 & 1/3 & -4/3 & 3 \\ -2 & 3 & 1 & -9 \\ 2 & 0 & 5 & 10 \end{bmatrix}$$

Add new 1 multiply by 2 new 2, R₂
 $R_2 + 2R_1$

(4)

$$\left[\begin{array}{cccc} 1 & 4/3 & -4/3 & 3 \\ 0 & 1/3 & -5/3 & -3 \\ 2 & 0 & 5 & 10 \end{array} \right]$$

Subtract R₂ by ~~3/11~~ R₃ - 3R₂/11

$$\left[\begin{array}{cccc} 1 & 4/3 & -4/3 & 9/11 \\ 0 & 1/3 & -5/11 & -9/11 \\ 0 & -2/3 & 23/3 & 28/3 \end{array} \right]$$

Subtract R₂ multiply by 1/3

$$\left[\begin{array}{cccc} 1 & 0 & -3/11 & 12/11 \\ 0 & 1 & -5/8 & -9/11 \\ 0 & -2/3 & 81/11 & \frac{102}{11} \end{array} \right]$$

Add row 2 multiplied by 2/3 to row 3

$$\frac{R_3 + 2R_2}{3}$$

$$\left[\begin{array}{cccc} 1 & 0 & -3/11 & 12/11 \\ 0 & 1 & -5/11 & -9/11 \\ 0 & 0 & 1 & -34/27 \end{array} \right]$$

(5)

Multiply row 3 by $11/81 R_3$

$$11R_3/81$$

$$\left[\begin{array}{cccc} 1 & 0 & 0 & 12/11 \\ 0 & 1 & -5/11 & -9/11 \\ 0 & 0 & 1 & 34/27 \end{array} \right]$$

Add row 3 $\times 13/11$ to $R_1 = R_1 13R_3/11$

$$\left[\begin{array}{cccc} 1 & 0 & 0 & 442/297 \\ 0 & 1 & -5/11 & -9/11 \\ 0 & 0 & 1 & 34/27 \end{array} \right]$$

Add row 3 $\times 5/11$ to R_2

$$R_2 + 5R_3/11$$

$$\left[\begin{array}{cccc} 1 & 0 & 0 & 442/297 \\ 0 & 1 & 0 & -3/297 \\ 0 & 0 & 1 & 34/27 \end{array} \right]$$

(6)

Solved Matrix

$$\begin{bmatrix} 1 & 0 & 0 & 50/27 \\ 0 & 1 & 0 & 13/27 \\ 0 & 0 & 1 & 34/27 \end{bmatrix}$$

Ans

(Question Number #03:

(a) Given Augmented matrix :

$$A = \begin{bmatrix} 2 & 2 & 4 & 9 \\ 8 & -6 & -8 & -6 \\ -1 & 2 & 3 & 4 \end{bmatrix}$$

$$\begin{bmatrix} -1 & 2 & 3 & 4 \\ 8 & -6 & -8 & -6 \\ 3 & 2 & 4 & 9 \end{bmatrix} R_1 \leftrightarrow R_3$$

$$\begin{bmatrix} -1 & 2 & 3 & 4 \\ 0 & 10 & 16 & 26 \\ 3 & 2 & 4 & 9 \end{bmatrix} R_2 \rightarrow R_2 + 8R_1$$

(7)

$$\left[\begin{array}{cccc} -1 & 2 & 3 & 4 \\ 0 & 10 & 16 & 26 \\ 0 & 8 & 13 & 21 \end{array} \right] R_3 \rightarrow R_3 + 3R_1$$

$$\left[\begin{array}{cccc} -1 & 2 & 3 & 4 \\ 0 & 10 & 16 & 26 \\ 0 & 0 & 0.2 & 0.2 \end{array} \right] R_3 \rightarrow R_3 - \frac{R_2}{10}$$

$$0.23 = 0.2$$

$$3 = 1$$

$$10y + 16z - 26$$

~~$$10y + 16z - 26$$~~

$$10y = 10$$

$$y = 1$$

~~$$-u + 2y + 3z - 4$$~~
~~$$-u + 2 + 3 = 4$$~~
~~$$-u = 4 - 5$$~~
~~$$-u = -1$$~~

$$-u + 2y + 3z - 4$$

$$-u + 2 + 3 = 4$$

$$-u = 4 - 5$$

$$-u = -1$$

$$u = 1$$

$$x = \text{solution} = \begin{bmatrix} 1 \\ 1 \\ 1 \end{bmatrix}$$

(8)

(b) Most of the digit cannot be written as 3 sig figures and above computation will have the same result.
 [No change in computation]

(c) Modified Augmented Matrix B:

$$n' = \begin{bmatrix} 3.1 & 2 & 4 & 9 \\ 8 & -6 & -8 & -6 \\ -1 & 2 & 3 & 4 \end{bmatrix}$$

$$\begin{bmatrix} -1 & 2 & 3 & 4 \\ 8 & -6 & -8 & -6 \\ 3.1 & 2 & 4 & 9 \end{bmatrix} \quad R_1 \rightarrow R_3$$

$$\begin{bmatrix} -1 & 2 & 3 & 4 \\ 0 & 10 & 16 & 26 \\ 3.1 & 2 & 4 & 9 \end{bmatrix} \quad R_2 \rightarrow R_2 + 8R_1$$

$$\begin{bmatrix} -1 & 2 & 8 & 4 \\ 0 & 10 & 16 & 26 \\ 0 & 8.2 & 13.3 & 21.4 \end{bmatrix} \quad R_3 \rightarrow R_3 + 3.1R_1$$

(9)

$$\left[\begin{array}{cccc} -1 & 2 & 3 & 4 \\ 0 & 10 & 16 & 26 \\ 0 & 0 & 0.18 & 0.08 \end{array} \right] \quad R_3 \rightarrow R_3 - R_2 \times 0.2$$

10

$$0.18_3 = 0.08$$

$$[3 = 0.444]$$

Question Number #04,

Cramssian elimination method:

$$\left[\begin{array}{cccc} 1 & -2 & 4 & 9 \\ 8 & -3 & 2 & 2 \\ -1 & 10 & 2 & 4 \end{array} \right]$$

$$A=9 \text{ (Student id)}$$

$$\text{Max } \{111, 181, 111\} = 8$$

$R_1 \rightarrow R_2$

$$\left[\begin{array}{cccc} 8 & -3 & 2 & 2 \\ 1 & -2 & 4 & 9 \\ -1 & 10 & 2 & 4 \end{array} \right]$$

(10)

$$R_2 - \frac{a_{21}}{a_{11}} R_1$$

$$R_3 - \frac{a_{31}}{a_{11}} R_1$$

$$\left[\begin{array}{cccc} 8 & -3 & 2 & 2 \\ -11/8 & -3 - (1/3) \times 3 & 4 - (1/8) \times 2 & 9 - (1/8) \times 2 \\ -1 - (-1/8) 8 & 10 - (-1/8) \times 3 & 2 - (-1/8) \times 2 & 4 - (-1/8) \times 3 \end{array} \right]$$

$$\left[\begin{array}{cccc} 8 & -3 & 2 & 2 \\ 0 & -1.675 & 3.75 & 17.75 \\ 0 & 9.675 & 2.25 & 4.25 \end{array} \right]$$

$$\text{Max} = \{11.625, 19.625\} = 19.625$$

$R_2 \leftrightarrow R_3$

$$\left[\begin{array}{cccc} 8 & -3 & 2 & 2 \\ 0 & 9.625 & 2.25 & 17.75 \\ 0 & -1.675 & 3.75 & 0.75 \end{array} \right]$$

(11)

$$R_3 = \frac{a_{32}}{a_{22}} R_2$$

$$\left[\begin{array}{cccc} 8 & -3 & 2 & 2 \\ 0 & 9.625 & 2.25 & 1.75 \\ 0 & \frac{-1.625}{9.625} & \frac{-1.625 - (-1.625)2.25}{9.625} & \frac{0.75 + \frac{1.625}{9.625}}{9.625} \end{array} \right]$$

$$3.75 - \frac{(-1.625)2.25}{9.625}$$

$$\left[\begin{array}{cccc} 8 & -3 & 2 & 2 \\ 0 & 9.625 & 2.25 & 1.75 \\ 0 & 0 & 4.1298 & 1.46753 \end{array} \right]$$

(a) Two row interchanges were needed

$$R_1 \leftrightarrow R_2$$

and

$$R_2 \leftrightarrow R_3$$

(b) Solved again using 3 sig fig

$$\left[\begin{array}{cccc} 8 & -3 & 2 & 2 \\ 0 & 9.62 & 2.25 & 1.75 \\ 0 & 0 & 4.130 & 1.417 \end{array} \right]$$

(12)

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

$$9.62y + 2.25z = 17.75$$

$$3 = \frac{1.47}{4.130}$$

$$\boxed{z = 0.35593}$$

$$9.62y + 2.25(0.35593) = 17.75$$

$$y = \frac{3.444}{9.62}$$

$$\boxed{y = 0.35854}$$

$$8x - 3(0.35854) + 2(0.35593) = 2$$

$$8x = 2.40376$$

$$x = 0.30047.$$

yes! same result.