

Math 244 – Quiz 1

Name: _____ ID: _____ Marks: _____ (5)

Question 1 [1 marks]

Determine whether the following is **True** or **False**

(a) We say that the linear system is inconsistent if it has only one solution. [*Flase*]

(b) The following linear system has no solution [*True*]

$$\begin{aligned}x_1 + 2x_2 &= 4 \\5x_1 + 10x_2 &= 7\end{aligned}$$

Question 2 [4 marks]

Solve the following linear system using **Gaussian elimination** or **Gauss-Jordan elimination**.

$$\begin{aligned}x + y + z &= 5 \\2x + 3y + 5z &= 8 \\4x + \cdots + 5z &= 2\end{aligned}$$

Solution: The Augmented matrix is

$$\begin{bmatrix}1 & 1 & 1 & 5 \\2 & 3 & 5 & 8 \\4 & 0 & 5 & 2\end{bmatrix}$$

Using the Gauss-Jordan elimination

$$\begin{aligned}&\begin{bmatrix}1 & 1 & 1 & 5 \\2 & 3 & 5 & 8 \\4 & 0 & 5 & 2\end{bmatrix} \xrightarrow{-2R_1+R_2} \begin{bmatrix}1 & 1 & 1 & 5 \\0 & 1 & 3 & -2 \\4 & 0 & 5 & 2\end{bmatrix} \xrightarrow{-4R_1+R_3} \begin{bmatrix}1 & 1 & 1 & 5 \\0 & 1 & 3 & -2 \\0 & -4 & 1 & -18\end{bmatrix} \\&\xrightarrow{4R_2+R_3} \begin{bmatrix}1 & 1 & 1 & 5 \\0 & 1 & 3 & -2 \\0 & 0 & 13 & -26\end{bmatrix} \xrightarrow{-R_2+R_1} \begin{bmatrix}1 & 0 & -2 & 7 \\0 & 1 & 3 & -2 \\0 & 0 & 13 & -26\end{bmatrix} \xrightarrow{\frac{R_3}{13}} \begin{bmatrix}1 & 0 & -2 & 7 \\0 & 1 & 3 & -2 \\0 & 0 & 1 & -2\end{bmatrix} \\&\xrightarrow{2R_3+R_1} \begin{bmatrix}1 & 0 & 0 & 3 \\0 & 1 & 3 & -2 \\0 & 0 & 1 & -2\end{bmatrix} \xrightarrow{-3R_3+R_2} \begin{bmatrix}1 & 0 & 0 & 3 \\0 & 1 & 0 & 4 \\0 & 0 & 1 & -2\end{bmatrix}\end{aligned}$$

$$x = 3, y = 4, z = -2.$$