MAT216 (Linear Algebra and Fourier Transformation)
Assignment 01 (14 June 2024)

Deadline: Offline: 22 June 2024 during class hour, OR
Online: 21 June 2024, 11:59 PM, send to shobhaislam.24@gmail.com

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* each question equals 4 marks, total marks = 20

1. Solve the following linear system using Gaussian elimination method

$$\begin{aligned} 2x_1 - x_2 + 3x_3 + 4x_4 &= 9 \\ x_1 - 2x_3 + 7x_4 &= 11 \\ 3x_1 - 3x_2 + x_3 + 5x_4 &= 8 \\ 2x_1 + x_2 + 4x_3 + 4x_4 &= 10 \end{aligned}$$

2. Solve the following linear system using Gauss-Jordan elimination method

$$\begin{aligned} -2q + 3r &= 1 \\ 3p + 6q - 3r &= -2 \\ 6p + 6q + 3r &= 5 \end{aligned}$$

3. (a) Determine the values of λ for which the following system has i) a unique solution, ii) no solution, and iii) many solutions

$$\begin{aligned} x + y + \lambda z &= 1 \\ x + \lambda y + z &= \lambda \\ \lambda x + y + z &= \lambda^2 \end{aligned}$$

(b) What is the conditions on α, β, and γ so that the following system of linear equations has a solution (i.e. the system is consistent) ?

$$\begin{aligned} x + 2y - 3z &= \alpha \\ 3x - y + 2z &= \beta \\ 2x - 10y + 16z &= 2\gamma \end{aligned}$$

4. Determine whether the following systems are consistent or inconsistent. If the system is consistent, write down the solution.

(a) $\begin{aligned} x_1 + x_2 + x_3 &= 1 \\ 2x_1 + 2x_2 + 2x_3 &= 1 \\ 3x_1 + 3x_2 + 3x_3 &= 2 \end{aligned}$

(b) $\begin{aligned} x_1 + 2x_2 + x_3 + x_4 &= 6 \\ x_1 - x_2 + x_3 - x_4 &= -2 \\ x_1 + 8x_2 + x_3 + 5x_4 &= 22 \\ 2x_1 + 7x_2 + 2x_3 + 4x_4 &= 20 \end{aligned}$

(c) $\begin{aligned} x_1 + 2x_2 + 3x_3 + 4x_4 &= 0 \\ 2x_1 + 3x_2 + 4x_3 &= 1 \\ 3x_1 + 4x_2 + x_4 &= 2 \\ 4x_1 + x_3 + 2x_4 &= 3 \end{aligned}$

5. Balance the following chemical reaction using system of linear equations

$$CO_2 + H_2O \longrightarrow C_6H_{12}O_6 + O_2$$