Key

Birzeit University
Mathematics Department
Math234
Quiz 1

Instructor: Dr. Ala Talahmeh
Name:.....
Section: 1

First Semester 2022/2023
Number:.....
Date: 16/11/2022

Exercise#1 [10 points]. Consider the linear system

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

Under what condition(s) on the constant α does the the system have:

(a) no solutions.

(b) a unique solution.

(c) infinitely many solutions.

$$\left[\begin{array}{ccc|c} 1 & 1 & -\alpha & -1 \\ -3 & -3 & \alpha^2+2 & \alpha+1 \end{array}\right] \quad (2 \text{ pts})$$

$$\xrightarrow[3R_1+R_2]{} \left[\begin{array}{ccc|c} 1 & 1 & -\alpha & -1 \\ 0 & 0 & (\alpha-2)(\alpha-1) & \alpha-2 \end{array}\right] \quad (2 \text{ pts})$$

(2 pts) (a) $\alpha = 1$

(2 pts) (b) None

(2 pts) (c) $\alpha \neq 1$

Good Luck

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Section: 5

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Exercise#1 [10 points]. Consider the linear system

$$\begin{aligned} x_1 + 2x_2 + x_3 - x_4 &= 0 \\ 2x_1 + 3x_2 + x_3 + x_4 &= -1 \\ x_2 + x_3 + \alpha x_4 &= \beta \end{aligned}$$

Under what conditions on the constants α and β does the the system have:

(a) no solutions.

(b) a unique solution.

(c) infinitely many solutions.

$$\left[\begin{array}{cccc|c} 1 & 2 & 1 & -1 & 0 \\ 2 & 3 & 1 & 1 & -1 \\ 0 & 1 & 1 & \alpha & \beta \end{array}\right] \quad (2 \text{ pts})$$

$$\xrightarrow[-2R_1+R_2]{} \left[\begin{array}{cccc|c} 1 & 2 & 1 & -1 & 0 \\ 0 & -1 & -1 & 3 & -1 \\ 0 & 1 & 1 & \alpha & \beta \end{array}\right] \quad (1 \text{ pt})$$

$$\xrightarrow[R_2+R_3]{} \left[\begin{array}{cccc|c} 1 & 2 & 1 & -1 & 0 \\ 0 & -1 & -1 & 3 & -1 \\ 0 & 0 & 0 & \alpha+3 & \beta-1 \end{array}\right] \quad (1 \text{ pt})$$

(a) $\alpha = -3$ and $\beta \neq 1$ (2 pts)

(b) None (2 pts)

(c) $\alpha \neq -3, \beta \in \mathbb{R}$ or $\alpha = -3, \beta = 1$ (2 pts)

Good Luck