Key

Birzeit University

Department of Mathematics

Quiz 1

Math 234 — February 20, 2019

Second Semester 2018/2019 — Section: 4

Name: ________ — Number: ________

Q1 [4 points]. Solve the following system by **Gauss-Jordan elimination.**

$$5x_1 - 2x_2 + 6x_3 = 0$$
$$-2x_1 + x_2 + 3x_3 = 1$$

Q2 [6 points]. For which values of α will the following system have no solution? Exactly one solution? Infinitely many solutions?

$$x_1 + 2x_2 - 3x_3 = 4$$
$$3x_1 - x_2 + 5x_3 = 2$$
$$4x_1 + x_2 + (\alpha^2 - 14)x_3 = \alpha + 2$$

Ans. Q1) the augmented matrix is

$$\left[\begin{array}{ccc|c} 5 & -2 & 6 & 0 \\ -2 & 1 & 3 & 1 \end{array}\right] \xrightarrow{2R_2+R_1} \left[\begin{array}{ccc|c} 1 & 0 & 12 & 2 \\ -2 & 1 & 3 & 1 \end{array}\right]$$

$$\xrightarrow[2R_1+R_2]{} \left[\begin{array}{ccc|c} 1 & 0 & 12 & 2 \\ 0 & 1 & 27 & 5 \end{array}\right] \Rightarrow \begin{array}{l} x_1 = 2 - 12x_3 \\ x_2 = 5 - 27x_3 \end{array}$$

let $x_3 = t \Rightarrow x_1 = 2 - 12t, \quad x_2 = 5 - 27t$.

the solution set $= \{(2-12t, 5-27t, t) : t \in \mathbb{R}\}$.

Q2) the augmented matrix is

$$\left[\begin{array}{ccc|c} 1 & 2 & -3 & 4 \\ 3 & -1 & 5 & 2 \\ 4 & 1 & \alpha^2-14 & \alpha+2 \end{array}\right] \xrightarrow[-4R_1+R_3]{-3R_1+R_2} \left[\begin{array}{ccc|c} 1 & 2 & -3 & 4 \\ 0 & -7 & 14 & -10 \\ 0 & -7 & \alpha^2-2 & \alpha-14 \end{array}\right]$$

Good Luck

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$$\longrightarrow \left[\begin{array}{ccc|c} 1 & 2 & -3 & 4 \\ 0 & 1 & -2 & \frac{10}{7} \\ 0 & -7 & \alpha^2-2 & \alpha-14 \end{array}\right]$$

$$\xrightarrow{} \begin{array}{c} \\ \\ 7R_2+R_3 \end{array} \left[\begin{array}{ccc|c} 1 & 2 & -3 & 4 \\ 0 & 1 & -2 & \frac{10}{7} \\ 0 & 0 & \alpha^2-16 & \alpha-4 \end{array}\right]$$

the system has infinitely many sols if $\boxed{\alpha = 4}$

" " " no solution if $\boxed{\alpha = -4}$

" " " Unique solution if $\boxed{\alpha \neq \pm 4}$