

## Math 244 – Quiz 1

Name: \_\_\_\_\_ ID: \_\_\_\_\_ Marks: \_\_\_\_\_ (5)

## Question 1 [1 marks]

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

(a) A homogeneous linear system with more unknowns than equations has no solution.

(F)

(b) The linear system

$$\begin{aligned}x - y &= 4 \\ 2x - 2y &= k\end{aligned}$$

cannot have a unique solution, regardless of the value of  $k$ .

(T)

## Question 2 [4 marks]

Solve the following linear system

$$\begin{aligned}x - 3y + z &= 4 \\ 2x - y + \dots &= -2 \\ 4x + \dots - 3z &= 0\end{aligned}$$

$$\left[ \begin{array}{ccc|c} 1 & -3 & 1 & 4 \\ 2 & -1 & 0 & -2 \\ 4 & 0 & -3 & 0 \end{array} \right] \xrightarrow[-4R_1+R_3]{-2R_1+R_2} \left[ \begin{array}{ccc|c} 1 & -3 & 1 & 4 \\ 0 & 5 & -2 & -10 \\ 0 & 12 & -7 & -16 \end{array} \right]$$

$$\xrightarrow{R_2/5} \left[ \begin{array}{ccc|c} 1 & -3 & 1 & 4 \\ 0 & 1 & -2/5 & -2 \\ 0 & 12 & -7 & -16 \end{array} \right] \xrightarrow{-12R_2+R_3} \left[ \begin{array}{ccc|c} 1 & -3 & 1 & 4 \\ 0 & 1 & -2/5 & -2 \\ 0 & 0 & -11/5 & 8 \end{array} \right]$$

$$\xrightarrow{-5/11 R_3} \left[ \begin{array}{ccc|c} 1 & -3 & 1 & 4 \\ 0 & 1 & -2/5 & -2 \\ 0 & 0 & 1 & -40/11 \end{array} \right] \xrightarrow{3R_2+R_1} \left[ \begin{array}{ccc|c} 1 & 0 & -1/5 & -2 \\ 0 & 1 & -2/5 & -2 \\ 0 & 0 & 1 & -40/11 \end{array} \right]$$

$$\xrightarrow[-1/5 R_3+R_1]{2/5 R_3+R_2} \left[ \begin{array}{ccc|c} 1 & 0 & 0 & -30/11 \\ 0 & 1 & 0 & -38/11 \\ 0 & 0 & 1 & -40/11 \end{array} \right]$$

$$x_1 = -30/11$$

$$x_2 = -38/11$$

$$x_3 = -40/11$$

Quiz 1

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The system has a unique solution.