

Last Name: SOLUTIONS

First Name: _____

Student ID: _____

Quiz 1 (A)

Question 1. (3 marks) Determine if the following are linear equations if x_1, x_2, x_3 are variables and k is a constant:

(a) $x_1 - x_2 + x_3 = \cos k$ LINEAR EQUATION

(b) $x_1 + 3x_2 + x_1x_3 = 2$ NOT A LINEAR EQUATION

(c) $\pi x_2 - \sqrt{2}x_1 + \frac{1}{3}x_3 = 5^{\frac{1}{4}}$ LINEAR EQUATION

Question 2. (7 marks) Determine whether the following matrices are in row-echelon form, reduced row-echelon form, or neither. If the matrix is in row-echelon form, reduced row-echelon form solve the corresponding system of equations:

(a)
$$\begin{bmatrix} 1 & 0 & 0 & 2 & 0 \\ 0 & 1 & 0 & 5 & 2 \\ 0 & 0 & 1 & 0 & 0 \\ 0 & 0 & 0 & 0 & 1 \end{bmatrix}$$
 ROW-ECHELON FORM
NO SOLUTION

(b)
$$\begin{bmatrix} 1 & 0 & 0 & 3 \\ 0 & 1 & 0 & 0 \\ 0 & 0 & 1 & 7 \end{bmatrix}$$
 REDUCED ROW-ECHELON FORM
SOLUTION SET:
 $(x_1, x_2, x_3) = (3, 0, 7)$

$$(c) \begin{bmatrix} 1 & 0 & 0 & 2 & 0 & 3 \\ 0 & 1 & 0 & 5 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 1 & 2 \end{bmatrix} \begin{array}{l} \text{NEITHER ROW-ECHELON OR} \\ \text{REDUCED ROW-ECHELON} \end{array}$$

$$(d) \begin{bmatrix} 1 & 7 & -2 & 1 & -8 & 3 \\ 0 & 0 & 1 & 1 & 2 & 2 \\ 0 & 0 & 0 & 0 & 1 & 3 \\ 0 & 0 & 0 & 0 & 0 & 0 \end{bmatrix} \text{ROW-ECHELON FORM}$$

FREE VARIABLES: LET $x_2 = s$, $x_4 = t$

- $x_5 = 3$

- $x_3 + x_4 + 2x_5 = 2$

$$x_3 + t + 2(3) = 2$$

$$x_3 = -4 - t$$

- $x_1 + 7x_2 - 2x_3 + x_4 - 8x_5 = 3$

$$x_1 + 7s - 2(-4 - t) + t - 8(3) = 3$$

$$x_1 = 3 - 7s - 8 - 2t - t + 24$$

$$= -7s - 3t + 19$$

SOLUTION SET:

$$(x_1, x_2, x_3, x_4, x_5) = (-7s - 3t + 19, s, -4 - t, t, 3)$$

$$s, t \in \mathbb{R}$$