

Last Name: SOLUTIONS

First Name: _____

Student ID: _____

Quiz 1 (B)

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) $x_1 - x_2 + x_3 = \sin k$ LINEAR EQUATION

(b) $\pi x_1 - \sqrt{2} x_3 + \frac{1}{3} x_2 = 7^{\frac{1}{3}}$ LINEAR EQUATION

(c) $x_1 - 4x_2 + x_1 x_3 = 7$ NOT A 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) $\begin{bmatrix} 1 & 0 & 0 & 2 & 0 & 3 \\ 0 & 1 & 0 & 5 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 1 & 2 \end{bmatrix}$ NEITHER ROW-ECHELON OR REDUCED ROW-ECHELON FORM

(b) $\begin{bmatrix} 1 & 0 & 0 & -2 \\ 0 & 1 & 0 & 3 \\ 0 & 0 & 1 & 0 \end{bmatrix}$ REDUCED ROW-ECHELON FORM

SOLUTION SET:

$$(x_1, x_2, x_3) = (-2, 3, 0)$$

$$(c) \begin{bmatrix} 1 & 6 & -2 & 1 & -8 & 2 \\ 0 & 0 & 1 & 1 & -2 & 2 \\ 0 & 0 & 0 & 0 & 1 & 2 \\ 0 & 0 & 0 & 0 & 0 & 0 \end{bmatrix} \text{ Row-Echelon Form}$$

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

$$\bullet x_5 = 2$$

$$\bullet x_3 + x_4 - 2x_5 = 2$$

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

$$x_3 = 6 - t$$

$$\bullet x_1 + 6x_2 - 2x_3 + x_4 - 8x_5 = 2$$

$$x_1 + 6s - 2(6-t) + t - 8(2) = 2$$

$$x_1 = 2 - 6s + 12 - 2t - t + 16$$

$$= -6s - 3t + 30$$

SOLUTION SET:

$$(x_1, x_2, x_3, x_4, x_5) = (-6s - 3t + 30, s, 6 - t, t, 2) \quad s, t \in \mathbb{R}$$

$$(d) \begin{bmatrix} 1 & 0 & 0 & 2 & 3 \\ 0 & 1 & 0 & 5 & 0 \\ 0 & 0 & 1 & 0 & 0 \\ 0 & 0 & 0 & 0 & 1 \end{bmatrix} \text{ Row-Echelon Form}$$

NO SOLUTION.