

MEMORIAL UNIVERSITY OF NEWFOUNDLAND

DEPARTMENT OF MATHEMATICS AND STATISTICS

ASSIGNMENT 5

MATH 2050

WINTER 2018

Due: Monday, March 5th, 2018. SHOW ALL WORK.

Note: You should complete the worksheet for Section 2.3 before you work on this assignment.

1. Solve each of the following systems of equations using Gaussian elimination and back-substitution. If a solution exists, express it as a vector or a linear combination of vectors.

$$(a) \quad \left. \begin{array}{l} x \quad \quad + 4z = 10 \\ 2x - y - 5z = -5 \\ -3x + 2y + 6z = 0 \end{array} \right\}$$

$$(b) \quad \left. \begin{array}{l} -x \quad \quad + 4z = 10 \\ 2x - y - 5z = -5 \\ -3x + 2y + 6z = 0 \end{array} \right\}$$

$$(c) \quad \left. \begin{array}{l} -x \quad \quad + 4z = -10 \\ 2x - y - 5z = -5 \\ -3x + 2y + 6z = 0 \end{array} \right\}$$

$$(d) \quad \left. \begin{array}{l} 3w + 12x - 6y \quad \quad = -15 \\ 2w + 8x - y + 3z = -4 \\ -w - 4x + 6y + 4z = 13 \end{array} \right\}$$

$$(e) \quad \left. \begin{array}{l} w + 2x + y + 2z = 4 \\ 4w - x + 5y \quad \quad = 2 \\ -7w - 3x + 5y + 4z = 7 \\ 2w \quad \quad + 6y + z = -5 \end{array} \right\}$$

PLEASE TURN OVER

2. Use Gaussian elimination to determine whether the vector $\mathbf{b} = \begin{bmatrix} 1 \\ -4 \\ 0 \\ 4 \end{bmatrix}$ is a linear combination of the columns of the matrix

$$A = \begin{bmatrix} 1 & -2 & -1 & -3 \\ 0 & 3 & 5 & -1 \\ 1 & -1 & 0 & -6 \\ 2 & 1 & 7 & -5 \end{bmatrix}.$$

3. Given the system

$$\left. \begin{array}{l} x + y + az = 1 \\ x + 2y + bz = 2 \\ 2x + 3y = c \end{array} \right\}$$

determine the conditions on a , b and c for which the system will have the indicated number of solutions, or explain why no such conditions are possible.

- (a) a unique solution
- (b) an infinite number of solutions
- (c) no solutions