

## Quiz 1

This quiz is graded out of 10 marks. No books, calculators, notes or cell phones are allowed. You must show all your work, the correct answer is worth 1 mark the remaining marks are given for the work. If you need more space for your answer use the back of the page.

**Question 1.** §1.1 #1c (1 mark) Determine whether the equation is linear in  $x_1$ ,  $x_2$ , and  $x_3$ :

$$x_1 = -7x_2 + 3x_3 \quad \text{Linear since it can be rearranged as}$$

$$a_1x_1 + a_2x_2 + \dots + a_nx_n = 0$$

**Question 2.** §1.1 #3c (1 mark) Determine whether the equations form a linear system.

$$\begin{array}{rclcl} 7x_1 & - & x_2 & + & 2x_3 & = & 0 \\ 2x_1 & + & x_2 & - & x_3x_4 & = & 3 \\ -x_1 & + & 5x_2 & - & x_4 & = & -1 \end{array} \quad \text{not a linear system since 2}^{\text{nd}} \text{ equation}$$

is not linear because of the term  $x_3x_4$ .

**Question 3.** §1.1 #12b (2 marks) Find a system of linear equations corresponding to the given augmented matrix.

$$\begin{bmatrix} 0 & 3 & -1 & -1 & -1 \\ 5 & 2 & 0 & -3 & -6 \end{bmatrix} \quad \begin{array}{l} 3x_2 - x_3 - x_4 = -1 \\ 5x_1 + 2x_2 - 3x_4 = -6 \end{array}$$

**Question 3.** §1.1 #13c (2 marks) Find the augmented matrix for the given system of linear equations

$$\begin{array}{rclcl} & 2x_2 & & - & 3x_4 & + & x_5 & = & 0 \\ -3x_1 & - & x_2 & + & x_3 & & & = & -1 \\ 6x_1 & + & 2x_2 & - & x_3 & + & 2x_4 & - & 3x_5 & = & 6 \end{array} \quad \begin{bmatrix} 0 & 2 & 0 & -3 & 1 & 0 \\ -3 & -1 & 1 & 0 & 0 & -1 \\ 6 & 2 & -1 & 2 & -3 & 6 \end{bmatrix}$$

**Question 4.** §1.2 #1g (2 marks) Determine whether the matrix is in row echelon form, reduced row echelon form, both, or neither.

$$\begin{bmatrix} 1 & -7 & 5 & 5 \\ 0 & 1 & 3 & 2 \end{bmatrix} \quad \text{is in row echelon form but not in reduced row echelon form since the 2}^{\text{nd}} \text{ leading 1 is not the only non-zero entry in its column.}$$

**Question 5.** §1.2 #4d (2 marks) Suppose that the augmented matrix for a system of linear equations has been reduced by row operations to the given row echelon form. Solve the system.

$$\begin{bmatrix} 1 & -3 & 0 & 0 \\ 0 & 0 & 1 & 0 \\ 0 & 0 & 0 & 1 \end{bmatrix} \quad \text{No solution since } 0x_1 + 0x_2 + 0x_3 = 1$$

$$0 = 1 \quad \swarrow$$