

## 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. (2 marks) Is the following a linear equations in the variables  $x_1, x_2$  and  $x_3$ , justify.

$$x_1 + 3x_2 + x_1x_3 = 2 \quad \text{No, since the last term of the left side has two variables multiplied}$$

Question 2. (2 marks) Find the augmented matrix for the following systems of linear equations.

$$\begin{array}{rcl} 2x_1 + 3x_3 & = & 1 \\ 3x_1 - 4x_2 - 3x_3 & = & 2 \\ -x_1 - 2x_2 & = & 0 \end{array} \quad \left[ \begin{array}{ccc|c} 2 & 0 & 3 & 1 \\ 3 & -4 & -3 & 2 \\ -1 & -2 & 0 & 0 \end{array} \right]$$

Question 3. (2 marks) Is the following matrix in reduced row-echelon form, justify.

$$\left[ \begin{array}{ccc|c} 1 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 \\ 0 & 0 & 1 & 1 \end{array} \right] \quad \text{No, since the row of zeros is not at the bottom.}$$

Question 4. (2 marks) Is the following matrix in row-echelon form, justify.

$$\left[ \begin{array}{ccc|c} 1 & 0 & 0 & 0 \\ 0 & 1 & 0 & 0 \\ 0 & 3 & 0 & 0 \end{array} \right] \quad \text{No, since the first non-zero entry of the third row is not a one.}$$

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

$$\left[ \begin{array}{ccc|c} 1 & 0 & 0 & -5 & 2 \\ 0 & 1 & 0 & 3 & 4 \\ 0 & 0 & 1 & 4 & 2 \end{array} \right] \Leftrightarrow \begin{array}{l} \textcircled{1} x_1 - 5x_4 = 2 \\ \textcircled{2} x_2 + 3x_4 = 4 \\ \textcircled{3} x_3 + 4x_4 = 2 \end{array}$$

no leading one for the 4<sup>th</sup> column.

Hence  $x_4 = t$  sub. in  $\textcircled{3}$

$$\begin{aligned} x_3 + 4t &= 2 \\ x_3 &= 2 - 4t \end{aligned}$$

sub. in  $\textcircled{2}$

$$\begin{aligned} x_2 + 3t &= 4 \\ x_2 &= 4 - 3t \end{aligned}$$

sub. in  $\textcircled{1}$

$$\begin{aligned} x_1 - 5t &= 2 \\ x_1 &= 2 + 5t \end{aligned}$$

$\therefore$  the solution set is

$$\begin{aligned} x_1 &= 2 + 5t \\ x_2 &= 4 - 3t \\ x_3 &= 2 - 4t \\ x_4 &= t \end{aligned} \quad t \in \mathbb{R}$$