Dawson College: Linear Algebra: 201-105-DW- . Fall 2009

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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.

$x_1^{-2} + 3x_2 + x_3 = 2$ No, since one of the variable has a power other than one.

Question 2. *(2 marks)* Find the system of linear equations corresponding to the following augmented matrix.

$$\begin{bmatrix} -1 & 2 & 8 & 11 \\ 2 & 1 & 9 & -1 \\ -4 & -8 & 0 & 0 \end{bmatrix}$$

$$\begin{aligned} -x + 2y + 8z &= 11 \\ 2x + y + 9z &= -1 \\ -4x - 8y &= 0 \end{aligned}$$

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

$$\begin{bmatrix} 0 & 1 & 0 \\ 1 & 0 & 0 \\ 0 & 0 & 0 \end{bmatrix}$$ No, since the leading one in the second row is to the left of the one above.

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

$$\begin{bmatrix} 1 & 3 & 2 \\ 0 & 0 & 0 \\ 0 & 0 & 1 \end{bmatrix}$$ No, since the row of zeros is not at the bottom.

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.

$$\begin{bmatrix} 1 & 0 & -1 & 0 & 3 \\ 0 & 1 & 2 & 0 & -2 \\ 0 & 0 & 0 & 1 & 4 \end{bmatrix} \Longleftrightarrow \begin{aligned} &① \quad x_1 - x_3 = 3 \\ &② \quad x_2 + 2x_3 = -2 \\ &③ \quad x_4 = 4 \end{aligned}$$

no leading one for the 3rd column.

Hence $x_3 = t$ sub. in ② $x_2 + 2t = -2$

$x_2 = -2 - 2t$

sub in ① $x_1 - t = 3$

$x_1 = 3 + t$

∴ the solution set is

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