

Name: ANSWER KEY

Math 20F - Linear Algebra - Winter 2003

Quiz #1 — January 14

1. Consider the following system of linear equations:

$$\begin{aligned}x_1 - x_2 + 3x_3 + 4x_4 &= 5 \\x_2 - x_4 &= 6.\end{aligned}$$

Is the system consistent? **YES**

Is the system underdetermined? **YES**

Is the system overdetermined? **NO**

Is the system homogeneous? **NO**

What is its solution set?

ANSWER:

Set $x_3 = \alpha$, $x_4 = \beta$.

Solution set = $\{(11 - 3\alpha - 3\beta, 6 + \beta, \alpha, \beta) : \alpha, \beta \in \mathbb{R}\}$.

2. Consider the matrix $A = \begin{pmatrix} 1 & 2 & 3 & 4 \\ 1 & 3 & 3 & 6 \\ 1 & 3 & 1 & 0 \end{pmatrix}$.

Express A in reduced row echelon form (rref). Show your work; use the back of the sheet if you need more space.

$$\begin{aligned}\text{ANSWER: } A &\Rightarrow \begin{pmatrix} 1 & 2 & 3 & 4 \\ 0 & 1 & 0 & 2 \\ 0 & 1 & -2 & -4 \end{pmatrix} \Rightarrow \begin{pmatrix} 1 & 2 & 3 & 4 \\ 0 & 1 & 0 & 2 \\ 0 & 0 & -2 & -6 \end{pmatrix} \\ &\Rightarrow \begin{pmatrix} 1 & 2 & 3 & 4 \\ 0 & 1 & 0 & 2 \\ 0 & 0 & 1 & 3 \end{pmatrix} \Rightarrow \begin{pmatrix} 1 & 2 & 0 & -5 \\ 0 & 1 & 0 & 2 \\ 0 & 0 & 1 & 3 \end{pmatrix} \Rightarrow \begin{pmatrix} 1 & 0 & 0 & -9 \\ 0 & 1 & 0 & 2 \\ 0 & 0 & 1 & 3 \end{pmatrix}\end{aligned}$$