

Name:
Student ID:

Thursday section time:

Math 20F - Linear Algebra - Spring 2003

Quiz #1 — April 10 — ANSWERS

(Do not discuss quiz with students who haven't taken it yet – until 8:00pm.)
You must show your work in order to get credit for a problem. Label your answers clearly.

Consider the following system of linear equations:

$$\begin{aligned}x_1 + 2x_2 + 3x_3 + 4x_4 &= 3 \\2x_1 + 2x_2 + 8x_3 + 6x_4 &= 8 \\x_3 - x_4 &= 1\end{aligned}$$

- Express this system of linear equations as an augmented matrix.
- Put it into reduced row echelon form (RREF).
- Which variables are free variables? Which variables are lead variables?
- What is the solution set of the system of linear equations?

ANSWERS:

a. $\left(\begin{array}{cccc|c} 1 & 2 & 3 & 4 & 3 \\ 2 & 2 & 8 & 6 & 8 \\ 0 & 0 & 1 & -1 & 1 \end{array} \right)$

b. $\Rightarrow \left(\begin{array}{cccc|c} 1 & 2 & 3 & 4 & 3 \\ 0 & -2 & 2 & -2 & 2 \\ 0 & 0 & 1 & -1 & 1 \end{array} \right) \Rightarrow \left(\begin{array}{cccc|c} 1 & 2 & 3 & 4 & 3 \\ 0 & 1 & -1 & 1 & -1 \\ 0 & 0 & 1 & -1 & 1 \end{array} \right) \Rightarrow \left(\begin{array}{cccc|c} 1 & 2 & 0 & 7 & 0 \\ 0 & 1 & 0 & 0 & 0 \\ 0 & 0 & 1 & -1 & 1 \end{array} \right)$
 $\Rightarrow \left(\begin{array}{cccc|c} 1 & 0 & 0 & 7 & 0 \\ 0 & 1 & 0 & 0 & 0 \\ 0 & 0 & 1 & -1 & 1 \end{array} \right)$

- x_4 is a free variable. x_1, x_2, x_3 are lead variables.
- Solution Set = $\{(-7\alpha, 0, 1 + \alpha, \alpha) : \alpha \in \mathbb{R}\}$.