MAS 3105 Jan 19, 2012
Quiz I Key Prof. S. Hudson

1) Use Gaussian elimination to put the following system into *reduced* row echelon form. Use matrix notation. Find the solution set, using α notation (if necessary) in your answer.

$$\begin{aligned} x_2 + x_3 &= 1 \\ x_1 + 2x_2 + x_3 &= 4 \end{aligned}$$

2) Write down the information in the traffic flow diagram [on the board] as a system of linear equations. Then solve it. Any valid method is OK, but remember to show your work.

3) Give an example of each [they are not related]. If you think that no example exists, explain clearly why not. Answer on the back.

a) An overdetermined system with infinitely many solutions.

b) A system with a free variable and a unique solution.

Remarks and Answers: The average grade was approx 79 / 100, based on the top 18 grades. The grades tended to be higher on Problems 1-2. The scale for the Quiz is

A's 87-100
B's 77-86
C's 67-76
D's 57-66

This is an unofficial scale, intended to give you a fairly accurate idea of how well you did. The average and the scale usually drop after the first or second quiz.

1)

$$\begin{pmatrix} 1 & 0 & -1 & 2 \\ 0 & 1 & 1 & 1 \end{pmatrix}$$

[Please imagine the vertical line after column 3]. $S = \{(2+\alpha, 1-\alpha, \alpha)\}$ For full credit, write the solution set this way, following all the conventions.

2) $x_1 - x_2 = -1$, $x_2 - x_3 = -1$, $x_3 + x_4 = 5$, $x_4 = 1$, $S = \{(2, 3, 4, 1)\}$ This was similar to exercises in the HW.

3a) There are many possible answers, for example;

$$\begin{aligned} x_1 + x_2 &= 0 \\ x_1 + x_2 &= 0 \\ x_1 + x_2 &= 0 \end{aligned}$$

3b) None exist. If there were such a system, it would have to be consistent, to have a solution. But then, with a free variable, there would be infinitely many solutions.

Almost nobody discussed whether the system was consistent. A minor issue maybe, but worth a couple of points. Always try to consider all the possibilities, and include them in your reasoning.