1) Solve this Leontief problem. The matrix A shows the flow of goods in a tribe with three clans D, F and H in that order. For example, clan D gives 0.5 units of their production to clan F each day. Assuming clan H produces \$ 22 worth of goods per day, find the value of the other clans' daily production, in dollars.

$$\begin{pmatrix} 0.3 & 0.4 & 0.4 \\ 0.5 & 0.4 & 0.3 \\ 0.2 & 0.2 & 0.3 \end{pmatrix}$$

2) Answer each with "True" or "False", no need to explain. REF means *row echelon form*.

a) Every row of a matrix in RREF must have a leading one.
b) An over-determined system can be consistent.
c) No homogeneous system in triangular form has a nontrivial solution.
d) Any system in RREF is also in REF.
e) A 3×5 system must have at least 2 free variables.

3) Give an example of an inconsistent under-determined system, or explain why impossible.

Remarks and Answers: The average score among the top half was approx 73, which is normal for a first quiz (and a little high for most others). The top two scores were 100's. But there were an unusual number of very low scores, with about half the scores under 50. Possibly, this was due to rather low scores on Problem 1. Such problems were in the reading, HW and lectures, but not on quizzes from previous terms. Again - I suggest studying more from your HW than from previous quizzes. The unofficial scale is:

A's 83 - 100   B's 73 - 82   C's 63 - 72   D's 53 - 62

1) [30pts] The economics part says $x_1 = 0.3x_1 + 0.4x_2 + 0.4x_3$ (etc, see the text or my lecture or HW.21), which leads to a homog sys with coefficients (it is harmless to omit the RHS zeroes here):

$$\begin{pmatrix} -0.7 & 0.4 & 0.4 \\ 0.5 & -0.6 & 0.3 \\ 0.2 & 0.2 & -0.7 \end{pmatrix} \rightarrow GE \rightarrow \begin{pmatrix} 1 & -4/7 & -4/7 \\ 0 & 1 & -41/22 \\ 0 & 0 & 0 \end{pmatrix}$$

so that x_3 is free. We are told that $x_3 = 22$, and then get $x_2 = 41$ and $x_1 = 36$. It is also OK to replace x_3 by 22 from the beginning, which leads to a smaller system, but approximately the same work, and the same answer. Since the results were pretty bad, I gave at least 20 points to people who got at least the first steps right.

2) [40pts] FTTTT

3) [30pts] Example: $x + y + z = 1$ and $x + y + z = 2$. I also accepted matrix formats, such as this (but with a vertical line inserted)

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