18.06 Professor Edelman Quiz 1 October 1, 1998

Your name is ____.

Please circle your recitation:

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1. (35 pts) Find the row reduced echelon forms R of all the matrices below:

(a.) The 3×4 matrix of all ones.

(b.) A general $m \times n$ matrix of all ones.

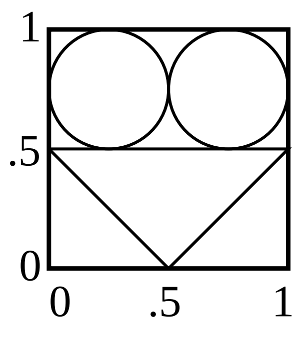
(c.) The 3×4 matrix with $a_{ij} = i + j - 1$.

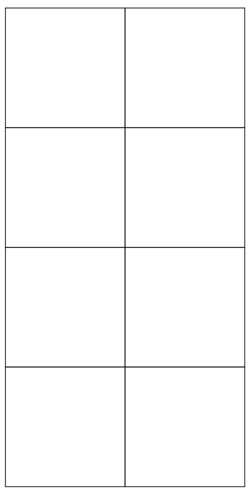
(d.) $A = \begin{pmatrix} 0 & 0 & 0 \\ 0 & 0 & 3 \\ 2 & 4 & 6 \end{pmatrix}$.

(e.) $A = \begin{pmatrix} 1 & 0 & 1 & 0 & 1 & 0 & 1 & 0 & 1 & 0 \\ 0 & 1 & 0 & 1 & 0 & 1 & 0 & 1 & 0 & 1 \\ 1 & 0 & 1 & 0 & 1 & 0 & 1 & 0 & 1 & 0 \\ 0 & 1 & 0 & 1 & 0 & 1 & 0 & 1 & 0 & 1 \\ 1 & 0 & 1 & 0 & 1 & 0 & 1 & 0 & 1 & 0 \\ 0 & 1 & 0 & 1 & 0 & 1 & 0 & 1 & 0 & 1 \\ 1 & 0 & 1 & 0 & 1 & 0 & 1 & 0 & 1 & 0 \\ 0 & 1 & 0 & 1 & 0 & 1 & 0 & 1 & 0 & 1 \\ 1 & 0 & 1 & 0 & 1 & 0 & 1 & 0 & 1 & 0 \\ 0 & 1 & 0 & 1 & 0 & 1 & 0 & 1 & 0 & 1 \end{pmatrix}$.

2. (20 pts) Sketch the image of the square figure to the left below after applying the map $A = \begin{pmatrix} 1 & 1 \\ -1 & 3 \end{pmatrix}$.

You may use the "graph paper" to its right. Please label the axes clearly.





3. (30 pts) Please briefly but clearly explain your answers.

(a.) Are the set of invertible 2×2 matrices in M a subspace?

(b.) Are the set of singular 2×2 matrices in M a subspace?

(c.) Consider the matrices in M whose nullspace contains $\begin{pmatrix} 1 \\ 1 \end{pmatrix}$.

Is this a subspace?

4. (15 pts) Find L and U for the nonsymmetric matrix $A = \begin{pmatrix} a & r & r & r \\ a & b & s & s \\ a & b & c & t \\ a & b & c & d \end{pmatrix}$. (Assume nothing is accidentally zero.)