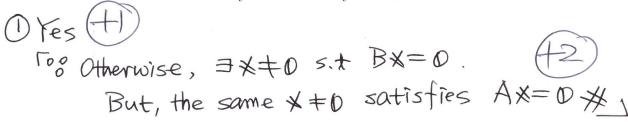
## Quiz #1 (CSE 4190.313)

## Monday, March 21. 2012

Name:	T2 :1.	
Name:	L-man.	

Dept: \_\_\_\_\_ ID No: \_\_\_\_

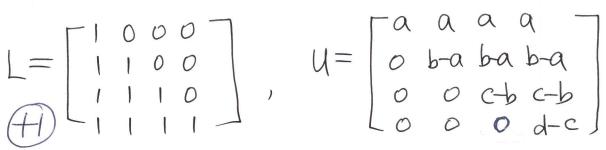
1. (5 points) Suppose A is invertible and you exchange its i-th and j-th rows to reach B. Is the new matrix B invertible? Why? How would you find  $B^{-1}$  from  $A^{-1}$ ?



2. (5 points) Compute L and U for the symmetric matrix

$$A = \left[ \begin{array}{cccc} a & a & a & a \\ a & b & b & b \\ a & b & c & c \\ a & b & c & d \end{array} \right].$$

Find four conditions on a, b, c, d to get A = LU with four pivots.





- 3. (6 points) True or false (with a counterexample if false and a reason if true):
  - (a) (3 points) A square matrix A with a row of zeros is not invertible.
  - (b) (3 points) If  $A^T$  is invertible then A is invertible.

For Suppose A is singular, 
$$\Rightarrow \exists x \neq 0 \text{ s.t. } Ax = 0$$
  
 $\Rightarrow xTA^{T} = oT \text{ and } x^{T} = x^{T}(A^{T} \cdot (A^{T})^{T}) = \overrightarrow{\sigma} \cdot \overrightarrow{A}^{T})^{T}$   
 $= oT_{x}$ 

- 4. (4 points) True or false? Give a specific counterexample when false.
  - (a) If columns 1 and 3 of B are the same, so are columns 1 and 3 of AB.
  - (b) If rows 1 and 3 of B are the same, so are rows 1 and 3 of AB.
  - (c) If rows 1 and 3 of A are the same, so are rows 1 and 3 of AB.
  - (d)  $(AB)^2 = A^2B^2$ .

Counter-example
$$A = \begin{bmatrix} 1 & 0 & 1 \\ 0 & 0 & 0 \\ 2 & 0 & 2 \end{bmatrix}, B = \begin{bmatrix} 1 \\ 0 \\ 1 \end{bmatrix}, AB = \begin{bmatrix} 2 \\ 0 \\ 4 \end{bmatrix}$$

Counter-example 
$$A = \begin{bmatrix} 0 & -1 \\ +1 & 0 \end{bmatrix}$$
,  $B = \begin{bmatrix} 1 & 0 \\ 0 & 2 \end{bmatrix}$   
 $A^2 = \begin{bmatrix} -1 & 0 \\ 0 & -1 \end{bmatrix}$ ,  $B^2 = \begin{bmatrix} 1 & 0 \\ 0 & 4 \end{bmatrix} \Rightarrow A^2B^2 = \begin{bmatrix} -1 & 0 \\ 0 & -4 \end{bmatrix}$   
 $AB = \begin{bmatrix} 0 & -2 \\ 1 & 0 \end{bmatrix}$ ,  $(AB)^2 = \begin{bmatrix} -2 & 0 \\ 0 & -2 \end{bmatrix}$ .  $(AB)^2 + A^2B^2$