Georgia Tech

School of Mathematics Math 1502

## CALCULUS II, SECTION K Quiz # 10 November 17 2010

First Name : \_\_\_\_\_

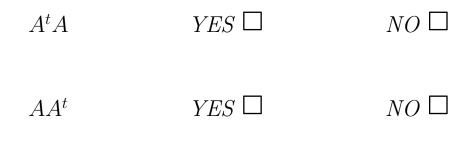
Last Name : \_\_\_\_\_

1. Let 
$$\mathbf{v}_1 = \begin{bmatrix} 1 \\ 0 \\ 1 \end{bmatrix}$$
,  $\mathbf{v}_2 = \begin{bmatrix} 1 \\ -1 \\ 0 \end{bmatrix}$ ,  $\mathbf{v}_3 = \begin{bmatrix} 1 \\ 2 \\ 3 \end{bmatrix}$ . What is the dimension of the subspace S they span in  $\mathbb{R}^3$ ?

$$\dim(S) =$$

(Use this page for your calculations)

2. Let A be an  $p \times q$  matrix with p < q. Let A has linearly independent rows. Are the following matrices invertible?



Why?

3. Let 
$$\mathbf{v}_1 = \begin{bmatrix} 2\\1\\0 \end{bmatrix}$$
,  $\mathbf{v}_2 = \begin{bmatrix} 3\\2\\2 \end{bmatrix}$ ,  $\mathbf{v}_3 = \begin{bmatrix} 1\\1\\0 \end{bmatrix}$ . If  $\mathbf{b} = \begin{bmatrix} 2\\2\\-2 \end{bmatrix}$ , find real numbers  $\lambda_1, \lambda_2, \lambda_3$  such that  $\mathbf{b} = \lambda_1 \mathbf{v}_1 + \lambda_2 \mathbf{v}_2 + \lambda_3 \mathbf{v}_3$ .

$$\begin{bmatrix} \lambda_1 \\ \lambda_2 \\ \lambda_3 \end{bmatrix} = \begin{bmatrix} & & \\ & & \end{bmatrix}$$

(Use this page for your calculations)

4. Let  $A = 3 \times 3$  matrix such that the equation  $A^{t}\mathbf{x} = 0$  only when  $\mathbf{x}$  is a multiple of  $\mathbf{v} = \begin{bmatrix} 1 \\ -2 \\ 1 \end{bmatrix}$ . Let then  $\mathbf{b} = \begin{bmatrix} \sqrt{3} \\ \sqrt{3} \\ \sqrt{3} \end{bmatrix}$ . Does  $A\mathbf{x} = \mathbf{b}$  has a solution? If yes is it unique?

$$A\mathbf{x} = \mathbf{b}$$
 has a solution YES  $\square$  NO  $\square$   
The solution is unique YES  $\square$  NO  $\square$ 

5. Find the orthogonal projection onto the subspace  $S \subset \mathbb{R}^3$  spanned by

the vectors 
$$\mathbf{v}_1 = \begin{bmatrix} 1 \\ -1 \\ 1 \end{bmatrix}$$
 and  $\mathbf{v}_2 = \begin{bmatrix} 1 \\ 1 \\ 0 \end{bmatrix}$ .

$$P_S =$$

(Use this page for your calculations)