

MATH221

quiz #1, 09/17/15

Total 100

Show all work legibly.

Name: _____

1. (20) Solve the system

$$\begin{array}{rcl} 2x_1 & -4x_3 & = 0 \\ & x_2 + 3x_3 & = 2 \\ x_1 + 5x_2 + 3x_3 & = & 0 \end{array}$$

$x_1 =$

$x_2 =$

$x_3 =$

2. (20) Determine values of h for which the system

$$2x_1 - 6x_2 = 4, \quad -4x_1 + hx_2 = 2$$

is consistent.

h is

3. (20) Let

$$A = \begin{bmatrix} 2 & 0 & 6 \\ -1 & 8 & 5 \\ 1 & -2 & 1 \end{bmatrix}.$$

True or False? The system $A\mathbf{x} = 0$ has a non trivial solution.

Mark one and explain.

- True False

4. (20) True or False? If A is 5×3 matrix, $\mathbf{y} = \begin{bmatrix} 1 \\ 2 \\ 3 \end{bmatrix}$, $\mathbf{b} = \begin{bmatrix} 0 \\ 5 \\ 6 \\ 0 \\ 1 \end{bmatrix}$, and $A\mathbf{y} = \mathbf{b}$, then the equation $A\mathbf{x} = 5\mathbf{b}$ is consistent.

Mark one and explain.

- True, $\mathbf{x} =$ False

5. (20) Consider the vectors

$$\mathbf{v}_1 = \begin{bmatrix} 2 \\ -5 \\ -3 \\ 1 \end{bmatrix}, \mathbf{v}_2 = \begin{bmatrix} 3 \\ 1 \\ -1 \\ 0 \end{bmatrix}, \mathbf{v}_3 = \begin{bmatrix} 0 \\ 0 \\ 0 \\ 0 \end{bmatrix}.$$

True or False? The vector \mathbf{v}_3 can be written as a linear combination of \mathbf{v}_1 and \mathbf{v}_2 .

Mark one and explain.

- True False

6. (20) Consider the vectors

$$\mathbf{v}_1 = \begin{bmatrix} 1 \\ -2 \\ 1 \end{bmatrix}, \mathbf{v}_2 = \begin{bmatrix} -2 \\ 1 \\ 1 \end{bmatrix}, \mathbf{v}_3 = \begin{bmatrix} 1 \\ 1 \\ 1 \end{bmatrix}, \text{ and the matrix } A = \begin{bmatrix} 1 & -2 & 1 \\ -2 & 1 & 1 \end{bmatrix} = \begin{bmatrix} \mathbf{v}_1^T \\ \mathbf{v}_2^T \end{bmatrix}.$$

(a) (10) True or False? $\mathbf{v}_1^T \mathbf{v}_3 = \mathbf{v}_2^T \mathbf{v}_3 = 0$.

Mark one and explain.

True False

(b) (10) True or False? $A\mathbf{x} = 0$ has a nontrivial solution.

Mark one and explain.

True, $\mathbf{x} =$ False