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$\bar{x}$ 21.1
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MATH 332
Quiz V
November 1, 1989 Name Key

1. Complete the following DEFinition: The vectors $v_1, \ldots, v_n$ are linearly independent if and only if

(5)

2. Find a basis for the solution space of the following system of homogeneous equations. The solution space is an 2 dimensional subspace of $\mathbb{R}^5$.

(7)

$$\left[\begin{array}{ccccc|c} 1 & 2 & 0 & 1 & -2 & 0 \\ 0 & 2 & 1 & 3 & 1 & 0 \\ 0 & 0 & -1 & 2 & 1 & 0 \end{array}\right]$$

$x_5 = t \quad x_4 = s$

$-x_3 + 2s + t = 0$

$x_3 = 2s + t$

$2x_2 + (2s+t) + 3s + t = 0$

$2x_2 = -5s - 2t$

$x_2 = -\frac{5}{2}s - t$

$x_1 + (-5s - 2t) + s - 2t = 0$

$x_1 = 4s + 4t$

$$\begin{bmatrix} x_1 \\ x_2 \\ x_3 \\ x_4 \\ x_5 \end{bmatrix} = s\begin{bmatrix} 4 \\ -5/2 \\ 2 \\ 1 \\ 0 \end{bmatrix} + t\begin{bmatrix} 4 \\ -1 \\ 1 \\ 0 \\ 1 \end{bmatrix}$$

3. What is the rank of

(3)

$$\begin{bmatrix} 2 & 9 \\ 0 & 3 \end{bmatrix} \quad 2$$

4. Consider the following matix:

(5)

$$\begin{bmatrix} 1 & 2 & 7 & 6 & -1 & 2 & 0 \\ 0 & 0 & 1 & 9 & 3 & 0 & 2 \\ 0 & 0 & 0 & 2 & 9 & 3 & 2 \\ 0 & 0 & 0 & 0 & 0 & 0 & 0 \end{bmatrix}$$

a. The row space is an 3 dimensional subspace of $\mathbb{R}^7$.

b. The column space is an 3 dimensional subspace of $\mathbb{R}^4$.

c. The rank is 3.

5. Do the vectors (1,2,3), (1,1,2), and (2,0,2) form a basis for R^3? Justify.

(5)

$$\det\begin{bmatrix} 1 & 2 & 3 \\ 1 & 1 & 2 \\ 2 & 0 & 2 \end{bmatrix} = -2\begin{vmatrix} 1 & 2 \\ 2 & 2 \end{vmatrix} + \begin{vmatrix} 1 & 3 \\ 2 & 2 \end{vmatrix} = -2(2-4) + (2-6) = 4 - 4 = 0$$

no!

OR $\begin{bmatrix} 1 & 1 & 2 \\ 0 & -1 & -4 \\ 0 & 0 & 0 \end{bmatrix}$

6. Give a basis for the subspace of symmetric matrices in M_{22}. What is th dimension of this subspace? What is the dimension of M_{22}?

(5)

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

dim 3

4