MATH 332
Quiz 3
November 16, 1994

$\bar{x} = 23.3$
$m = 23$

allowed 25 min
bunch left at 10
most ~ 15
all by 25

Name Key

8 1. Definitions:

a. A subset H of a vector space V is called a subspace of V if and only if

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b. The vectors $b_1, b_2, \ldots, b_p$ form a basis for a vector space V if and only if

15 /m almost all

5 2. Find a basis for the subspace spanned by the vectors (1,1,-2,3), (-3,-3,8,-6), (0,0,4,6).
This is a $\underline{2}$ dimensional subspace of $\underline{\mathbb{R}^4}$.

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$$\begin{bmatrix} 1 & 1 & -2 & 3 \\ -3 & -3 & 8 & -6 \\ 0 & 0 & 4 & 6 \end{bmatrix} \to \begin{bmatrix} 1 & 1 & -2 & 3 \\ 0 & 0 & 2 & 3 \\ 0 & 0 & 4 & 6 \end{bmatrix} \to \begin{bmatrix} 1 & 1 & -2 & 3 \\ 0 & 0 & 2 & 3 \\ 0 & 0 & 0 & 0 \end{bmatrix}$$

$(1,1,-2,3)$ $(0,0,2,3)$

15 3. The matrix $A = \begin{bmatrix} 1 & 2 & 2 & 0 & 1 \\ -4 & -7 & -6 & -3 & -4 \\ 3 & 8 & 10 & -6 & 3 \end{bmatrix}$ is row equivalent to $\begin{bmatrix} 1 & 2 & 2 & 0 & 1 \\ 0 & 1 & 2 & -3 & 0 \\ 0 & 0 & 0 & 0 & 0 \end{bmatrix}$

9 all

2 a. Find a basis for the row space of A:

$(1,2,2,0,1)$ $(0,1,2,-3,0)$

2 b. Find a basis for the column space of A:

$(1,-4,3)$ $(2,-7,8)$

2 c. The row space of A is a $\underline{2}$ dimensional subspace of $\underline{\mathbb{R}^5}$.

2 d. The column space of A is a $\underline{2}$ dimensional subspace of $\underline{\mathbb{R}^3}$.

$\frac{6}{\frac{9}{15}}$

1 e. The rank of A is $\underline{2}$.

2 f. The nullspace of A is a $\underline{3}$ dimensional subspace of $\underline{\mathbb{R}^5}$.

2 g. Find a basis for the null space of A:

$x_5 = t \quad x_4 = s, \quad x_3 = u$

$x_2 + 2u - 3s = 0$

$x_2 = -2u + 3s$

$-4u + 6s$

$x_1 + 2(-2u + 3s) + 2u + t = 0$

$x_1 = 2u - 6s - t$

$$t\begin{bmatrix} -1 \\ 0 \\ 0 \\ 0 \\ 1 \end{bmatrix} + s\begin{bmatrix} 6 \\ 3 \\ 0 \\ 1 \\ 0 \end{bmatrix} + u\begin{bmatrix} 2 \\ -2 \\ 1 \\ 0 \\ 0 \end{bmatrix}$$

$(-1,0,0,0,1)$
$(-6,3,0,1,0)$
$(2,-2,1,0,0)$

3 4. Find a basis for the subspace of M_{22} (the 2x2 matrices) consisting of matrices where the 1,1 entry is 0. What is the dimension of this subspace?

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$$\begin{bmatrix} 0 & b \\ c & d \end{bmatrix} \quad \begin{bmatrix} 0 & 1 \\ 0 & 0 \end{bmatrix} \begin{bmatrix} 0 & 0 \\ 1 & 0 \end{bmatrix} \begin{bmatrix} 0 & 0 \\ 0 & 1 \end{bmatrix} \quad 3$$