Linear Algebra / MAT 2233.901
Midterm 1 / March 11, 1999 / Instructor: D. Gokhman

Name: _____

Please show all work.

1. (10 pts.) Describe and sketch the general solution of the system of linear equations given by the augmented matrix $\begin{bmatrix} 1 & -2 & 0 & 3 \\ 0 & 0 & 1 & 5 \end{bmatrix}$.

2. (10 pts.) For which h is the sequence $\begin{bmatrix} 0 \\ 1 \\ -2 \end{bmatrix}, \begin{bmatrix} 2 \\ -3 \\ 5 \end{bmatrix}, \begin{bmatrix} 2 \\ 0 \\ h \end{bmatrix}$ not linearly independent?

3. (16 pts.) For each of the following matrices describe and sketch the span of the columns.

$$\text{(a) } \begin{bmatrix} 3 & 1 \\ 6 & 2 \end{bmatrix} \quad \text{(b) } \begin{bmatrix} 0 & 0 \\ 0 & 0 \end{bmatrix} \quad \text{(c) } \begin{bmatrix} 1 & -1 \\ 1 & 1 \end{bmatrix} \quad \text{(d) } \begin{bmatrix} 3 & 0 \\ 1 & 3 \\ 0 & -1 \end{bmatrix}$$

4. (16 pts.) Find the standard matrix for each linear map T, where

   (a) $T\left(\begin{bmatrix} 1 \\ 1 \end{bmatrix}\right) = \begin{bmatrix} 3 \\ 2 \\ 1 \end{bmatrix}$ and $T\left(\begin{bmatrix} -1 \\ 1 \end{bmatrix}\right) = \begin{bmatrix} -1 \\ 0 \\ 1 \end{bmatrix}$,

   (b) $T\colon \mathbf{R}^2 \to \mathbf{R}^2$ is the reflection with respect to the line $x_1 = x_2$.

5. (16 pts.) For each of the matrices in problem 3 consider the corresponding linear map T. In each case, is T 1-1? Onto? Explain.

1	2	3	4	5	total (68)	%