

Exam 1  
MA 322  
June 28, 2007

1. Find a matrix whose inverse is  $D = \begin{bmatrix} -2 & 4 \\ -3 & 5 \end{bmatrix}$ .

2. Is the matrix  $\begin{bmatrix} 2 & 0 & 0 & 8 \\ 1 & 0 & -5 & 0 \\ 3 & 8 & 6 & 0 \\ 0 & -1 & 5 & 4 \end{bmatrix}$  invertible? Why?

3. (a) Are the vectors  $\mathbf{v}_1 = \begin{bmatrix} 1 \\ 5 \\ -3 \end{bmatrix}$ ,  $\mathbf{v}_2 = \begin{bmatrix} -2 \\ -9 \\ 6 \end{bmatrix}$ ,  $\mathbf{v}_3 = \begin{bmatrix} 3 \\ -2 \\ -11 \end{bmatrix}$ ,  $\mathbf{v}_4 = \begin{bmatrix} 0 \\ -1 \\ 11 \end{bmatrix}$  linearly independent? Why?

- (b) Geometrically, describe  $\text{Span}\{\mathbf{v}_1, \mathbf{v}_2, \mathbf{v}_3\}$ . Justify your answer.

4. Is the linear transformation given by

$$T(x_1, x_2, x_3) = (3x_1 - 14x_2 - x_3, x_1 - 5x_2 + x_3, x_2 - 4x_3)$$

onto  $\mathbb{R}^3$ ? Why?

5. (a) Find the solution set for the homogeneous system with coefficient matrix  $A = \begin{bmatrix} 1 & 3 & -3 & 7 \\ 2 & 7 & -10 & 19 \end{bmatrix}$ . Write your answer in parametric form.

- (b) Find the solution set for the matrix equation  $A\mathbf{x} = \begin{bmatrix} 1 \\ 1 \end{bmatrix}$ .

6. Find  $A^{-1}$  if  $A = \begin{bmatrix} 1 & -2 & 1 \\ 4 & -7 & 3 \\ -2 & 6 & -6 \end{bmatrix}$ .

7. Given the system of equations

$$\begin{aligned} -2x_1 + hx_2 &= 1 \\ 6x_1 + x_2 &= k \end{aligned}$$

Determine  $h$  and  $k$  such that the solution set of the system

(a) does not exist

(b) is unique

(c) is infinite

8. If  $A$  is invertible, explain why  $\det A^{-1} = \frac{1}{\det A}$ .