

MA552. Homework 2

Homework due September 12, 2006

1. Solve the following systems

$$\text{a) } \begin{cases} 3x_1 + 2x_2 + 4x_3 + 4x_4 + 5x_5 = 2 \\ 7x_1 + 5x_2 + 9x_3 + 8x_4 + 9x_5 = 3 \\ 5x_1 + 3x_2 + 7x_3 + 9x_4 + 4x_5 = 3 \\ 6x_1 + 5x_2 + 7x_3 + 5x_4 - 5x_5 = -3 \end{cases}$$

$$\text{b) } \begin{cases} 3x_1 + 5x_2 + 2x_3 + 4x_4 = 3 \\ 2x_1 + 3x_2 + 4x_3 + 5x_4 = 1 \\ 5x_1 + 9x_2 - 2x_3 + 2x_4 = 9 \end{cases}$$

$$\text{c) } \begin{cases} 3x_1 + 4x_2 + 3x_3 + 2x_4 = 0 \\ 5x_1 + 7x_2 + 4x_3 + 3x_4 = 0 \\ 4x_1 + 5x_2 + 5x_3 + 3x_4 = 0 \\ 5x_1 + 6x_2 + 7x_3 + 4x_4 = 0 \end{cases}$$

2. Find the inverse matrix A^{-1} if it exists:

$$\text{a) } A = \begin{pmatrix} 1 & 5 & 4 \\ 2 & 8 & 7 \\ 1 & 7 & 5 \end{pmatrix}$$

$$\text{b) } A = \begin{pmatrix} 1 & 3 & 3 \\ 3 & 8 & 7 \\ 2 & 7 & 9 \end{pmatrix}$$

3. Prove that the following vectors are linearly dependent in R^3 :

$$\alpha_1 = (3, 0, -3)$$

$$\alpha_2 = (-1, 1, 2)$$

$$\alpha_3 = (4, 2, -2)$$

$$\alpha_4 = (2, 1, 1)$$

4. Given the following five vectors in R^4 :

$$\alpha_1 = (1, 1, 2, 1)$$

$$\alpha_2 = (1, -1, 0, 1)$$

$$\alpha_3 = (0, 0, -1, 1)$$

$$\alpha_4 = (1, 2, 2, 0)$$

$$\alpha_5 = (1, 1, 1, 1)$$

a) Show that $\alpha_1, \alpha_2, \alpha_3, \alpha_4$ is a basis of R^4

b) Find the coordinates of α_5 in the basis $\{\alpha_1, \alpha_2, \alpha_3, \alpha_4\}$