

ECON3120/4120 Mathematics 2, spring 2007

Problems for Seminar 5, 7 March 2007

1 Write the following systems of equations in matrix notation:

$$\begin{array}{ll} \text{(a)} & \begin{array}{l} 2x_1 - 5x_2 = 3 \\ 5x_1 + 8x_2 = 5 \end{array} \\ & \begin{array}{l} ax + y + (a+1)z = b_1 \\ x + 2y + z = b_2 \\ 3x + 4y + 7z = b_3 \end{array} \end{array}$$

$$\begin{array}{l} x + y + z + t = a \\ \text{(c)} \quad x + 3y + 2z + 4t = b \\ \quad x + 4y + 8z = c \\ 2x + z - t = d \end{array}$$

2 Using the matrices

$$\mathbf{A} = \begin{pmatrix} 2 & 3 \\ 1 & 4 \end{pmatrix}, \quad \mathbf{B} = \begin{pmatrix} -1 & 2 \\ 1 & -1 \end{pmatrix}, \quad \mathbf{C} = \begin{pmatrix} 2 & 0 \\ -1 & 1 \end{pmatrix}, \quad \mathbf{D} = \begin{pmatrix} 1 & 1 & 1 \\ 1 & 3 & 4 \end{pmatrix}$$

calculate (where possible)

$$\begin{array}{lll} \text{(a)} & 2\mathbf{A} - 3\mathbf{B} & \text{(b)} \quad (\mathbf{A} - \mathbf{B})' & \text{(c)} \quad (\mathbf{C}'\mathbf{A}')\mathbf{B}' \\ \text{(d)} & \mathbf{C}'(\mathbf{A}'\mathbf{B}') & \text{(e)} \quad \mathbf{D}'\mathbf{D}' & \text{(f)} \quad \mathbf{D}'\mathbf{D} \end{array}$$

3 The equation

$$ze^z - xy = 0$$

defines z as a function of x and y in a neighbourhood of the point $(x, y, z) = (1, e, 1)$. Find $z'_1(1, e)$, $z'_2(1, e)$, and $z''_{12}(1, e)$.

4 Exam problem 127.

5 Using Gauss-elimination find all solutions to

$$\begin{array}{rcl} x_1 + x_2 & - 2x_4 & = 2 \\ & 2x_2 + x_3 + x_4 & = 3 \\ x_1 + x_2 & + x_4 & = 2 \end{array}$$