

ECON3120/4120 – Mathematics 2, spring term 08: **Problems for seminar 5, week 11**

**1** Write the following systems of equations in matrix notation:

$$\begin{array}{lll}
 & x + y + z + t = a & ax + y + (a + 1)z = b_1 \\
 (a) \quad \begin{array}{l} 2x_1 - 5x_2 = 3 \\ 5x_1 + 8x_2 = 5 \end{array} & (b) \quad \begin{array}{l} x + 3y + 2z + 4t = b \\ x + 4y + 8z = c \\ 2x + z - t = d \end{array} & (c) \quad \begin{array}{l} x + 2y + z = b_2 \\ 3x + 4y + 7z = b_3 \end{array}
 \end{array}$$

**2** Using the matrices

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

calculate (where possible),

$$(a) 2\mathbf{A} - 3\mathbf{B} \quad (b) (\mathbf{A} - \mathbf{B})' \quad (c) (\mathbf{C}'\mathbf{A}')\mathbf{B}' \quad (d) \mathbf{C}'(\mathbf{A}'\mathbf{B}') \quad (e) \mathbf{D}'\mathbf{D}' \quad (f) \mathbf{D}'\mathbf{D}$$

**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** Use Gauss-elimination to find all solutions to

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