ECON3120/4120 – Mathematics 2, fall term 07: **Problems for seminar 5, Oct. 15**

(And this time I got the date right!)

1 Write the following systems of equations in matrix notation:

(a)
$$\begin{aligned} 2x_1 - 5x_2 &= 3 \\ 5x_1 + 8x_2 &= 5 \end{aligned}$$

(b)
$$\begin{aligned} x + y + z + t &= a \\ x + 3y + 2z + 4t &= b \\ x + 4y + 8z &= c \\ 2x + z - t &= d \end{aligned}$$

(c)
$$\begin{aligned} ax + y + (a+1)z &= b_1 \\ x + 2y + z &= b_2 \\ 3x + 4y + 7z &= b_3 \end{aligned}$$

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

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