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ECON3120/4120 Mathematics 2, spring 2009

Problems for Seminar 6, 2–6 March

1 **EMEA:** 15.7.3, 15.7.8, 15.8.2, 15.8.4
= **LA:** 2.1.5, 2.2.4, 2.3.2, 2.3.3.

2 The price vector is $(4, 2, 5)$ and you can just afford to buy the commodity vector $(6, 4, 3)$. What is your budget constraint?

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

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

4 (= 15.R.3 in EMEA) 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)

(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) $\mathbf{D}'\mathbf{D}$

5 Find the general solution of the differential equation

$$\dot{x} + \frac{2}{t}x = e^t \,.$$

Find, in particular, the integral curve passing through $(t, x) = (1, 1)$.

6 Exam problem 36.