

**ECON3120/4120 Mathematics 2, spring 2007**

**Problems for Seminar 7, 11 April 2007**

**1** Exam problem 142.

**2** Find the general solution of the differential equation

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

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

**3** Given the matrix

$$\mathbf{A}_t = \begin{pmatrix} 1 & t & 0 \\ -2 & -2 & -1 \\ 0 & 1 & t \end{pmatrix}$$

(a) Calculate  $|\mathbf{A}_t|$  and show that  $(\mathbf{A}_t)^{-1}$  exists for all  $t$ .

(b) Show that for a certain value of  $t$  we have  $(\mathbf{A}_t)^3 = \mathbf{I}_3$ , where  $\mathbf{I}_3$  is the identity matrix of order 3.

(c) Find the inverse of  $\mathbf{A}_1$ .

(d) Suppose that  $\mathbf{A}$  and  $\mathbf{B}$  are invertible  $n \times n$  matrices. Show that if  $\mathbf{A}'\mathbf{A} = \mathbf{I}_n$ , then  $(\mathbf{A}'\mathbf{B}\mathbf{A})^{-1} = \mathbf{A}'\mathbf{B}^{-1}\mathbf{A}$ .

**4** Exam problem 31.

**5** Exam problem 92.