

Compulsory term paper 1 in ECON3120/4120 Mathematics 2
Second attempt

(1 page of problems.)

Hand in at the department office, 12th floor, or to Arne Strøm, on or before
Friday 15 October 2004.

Problem 1

Consider the functions f and g given by

$$f(x) = \frac{1}{e^{2x} - 1}, \quad g(x) = \frac{1}{2} \ln(e^{2x-1} - 1) - x$$

for all $x > 0$.

(a) Show that g is an indefinite integral of f .

(b) Find the exact value of $\int_1^2 f(x) dx$.

Problem 2

Let \mathbf{A} be the matrix $\mathbf{A} = \begin{pmatrix} 1 & 1 \\ 1 & 0 \\ 0 & 1 \end{pmatrix}$.

(a) Calculate the matrix product $\mathbf{A}'\mathbf{A}$ and the determinant $|\mathbf{A}'\mathbf{A}|$.

(b) Does $\mathbf{A}'\mathbf{A}$ have an inverse? Find $(\mathbf{A}'\mathbf{A})^{-1}$ if it exists.

Problem 3

Let f be the function given by

$$f(x, y) = (x^2 + y^2)(xy + 1) \quad \text{for all } x \text{ and } y.$$

(a) Find the first- and second-order partial derivatives of f .

(b) Show that $(\frac{1}{2}\sqrt{2}, -\frac{1}{2}\sqrt{2})$ and $(-\frac{1}{2}\sqrt{2}, \frac{1}{2}\sqrt{2})$ are stationary points for f .
Does f have any other stationary points?