Department of Mathematics
STOCKHOLM UNIVERSITY

Examiner: Paul Vaderlind

Examination in
Mathematics for Economic and Statistical Analysis
Master Programme; 7,5 ECTS
January, 12, 2009; time: 09:00–14:00

All calculators, except for the graphic, are allowed. Each solved problem is awarded by up to 10 points. At least 50% of points are necessary for the grade E (Sufficient). Note that the problems are not ordered according to the difficulty!

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1. Find the largest and the smallest value of the function $f(x) = (x^2 - 4x + 1)e^x$, where $0 \leq x \leq 4$.

2. There is a line L which is common tangent to both curves $y = x^2$ and $y = x^2 + 4x + 1$. Find te equation of the line L.

3. Find all x for which both infinite series below converge:

$$1 + \frac{1}{4}\ln^2 x + \frac{1}{16}\ln^4 x + \frac{1}{64}\ln^8 x + \ldots \quad \text{and} \quad 1 - 2e^{-x} + 4e^{-2x} - 8e^{-3x} + 16e^{-4x} - \ldots$$

4. Find all the stationary points of the function $z = 2x^3 + 6x^2y + y^3 - 12y$ and determine if they are local maximum, minimum or saddle points.

5. Evaluate the following integrals:

a) $\displaystyle\int_1^e \frac{\ln x}{x(1 + \ln^2 x)}\,dx,$ b) $\displaystyle\int_0^1 y^2 e^{2y}\,dy$

6. The equaition $3x^2y + e^{x+y} + \ln(x + y) - e = 0$ defines y as a function of x, $y = y(x)$. Find the derivatives $y'(x)$ and $y''(x)$ at the point $(x, y) = (0, 1)$.

GOOD LUCK!

The papers will be handed out at 12.00 on Monday, January 26, 2009, in the room next to the Coffee Shop, house 5, and after that in room 208, house 6.