

This exam consists of five problems, each of which is worth 4 points. Premium points obtained in the problem solving class will be taken into account. Marks:

| Points | ECTS mark | Swedish mark |
|--------|-----------|--------------|
| 20-23 | A | VG |
| 18-19 | B | VG |
| 15-17 | C | G |
| 12-14 | D | G |
| 9-11 | E | G |

1. Determine the following limit (if it exists).

$$\lim_{x \rightarrow \pi/4} \frac{1 - \tan x}{\sin x - \cos x}.$$

2. Evaluate the derivative of the implicit function $(x^2 + 4)y = 8$ at the point $(2, 1)$.

3. Evaluate the definite integral

$$\int_0^{\pi/4} x \sec^2 x dx.$$

4. Find the particular solution of the differential equation that satisfies the boundary condition.

$$y' + (2x - 1)y = 0, \quad y(1) = 2.$$

5. Use the Root Test to determine the convergence or divergence of the series.

$$\sum_{n=1}^{\infty} e^{-n}.$$

Good luck!