

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
20–24	A	VG
18–19	B	VG
15–17	C	G
12–14	D	G
9–11	E	G

1. Evaluate the limit or explain why it does not exist.

$$\lim_{x \rightarrow \infty} \arctan \left(\frac{x + \sin(x)}{x} \right).$$

2. Suppose y is implicitly defined by $\tan(y) = x + y$. Evaluate $\frac{dy}{dx}$. The answer should not contain any trigonometric functions.

3. Evaluate the definite integral.

$$\int_0^4 \frac{\sqrt{x}}{x+1} dx.$$

4. Solve the differential equation.

$$y' + \cos(x)y = 0.$$

5. Find the radius of convergence of the power series. HINT: You can use the ratio test.

$$\sum_{n=1}^{\infty} n^2 x^n.$$

Good luck!