

In all your solutions, give explanations to clearly show your reasoning.

Allowed aids: The calculator and formula sheet provided with the exam.

1. (a) You plan to deposit 500 SEK at the end of each month on an account (3p)
with 3.6% yearly interest, compounded monthly. How much money will
be on the account after 3 years?
(b) Determine the Taylor polynomial of degree 4 for the function at the (2p)
point $x = -1$ for the function $f(x) = e^{2x+2}$.

2. The equation

$$y^3 + y = x^3 - 3x$$

defines y as a function $y(x)$.

- (a) Show that $y(2) = 1$, and determine the tangent line at $x = 2$. (3p)
 - (b) Determine the stationary points of $y(x)$. (2p)
3. Determine local and global extreme points, and the limits as $x \rightarrow \pm\infty$, of (5p)
the function

$$f(x) = \frac{x^3}{e^x},$$

and sketch its graph.

4. (a) Determine the integral $\int (\sqrt{2x+1} + x^2(x^3+1)^4) dx$. (2p)

- (b) Compute $\int_0^\infty x e^{-x^2} dx$. (3p)

5. Let $A = \begin{pmatrix} 1 & 0 & 1 \\ 0 & 2 & 1 \\ 1 & 1 & 1 \end{pmatrix}$ and $B = \begin{pmatrix} 1 \\ 0 \\ 2 \end{pmatrix}$.

- (a) Compute the determinant of A . (2p)
 - (b) Determine the the inverse of A . (2p)
 - (c) Solve the matrix equation $AX = B$. (1p)
6. Determine the maximum value of the function $f(x, y) = x^2 y e^{4-x-y}$ on the (5p)
domain given by $x \geq 0$, $y \geq 0$ and $x + y \leq 4$.