

Examination Basic Mathematics, 2DL03, Wednesday 22 June 2011, 9.00–12.00 uur.

Write clearly the program (Pre-master program or TU/e-minor) you are following on the first page of your work.

The exam consists of 12 problems.

The answers and the computations should be written out well-formulated and well-organized.

It is not allowed to use a laptop, graphical or programmable calculator, chart with formulas, a book or other written material.

You may use a simple calculator simply and solely to check your answers.

1. Solve the inequality $\frac{1 + \ln(x)}{2 - \ln(x)} > 1$.
2. Consider the function f defined by $f(x) = \frac{1 - x}{x + 2}$.
 - (a) Sketch the graph of f and find the domain $D(f)$ and the range $R(f)$.
 - (b) Find the inverse function f^{-1} .
3. Approximate $\sqrt{26}$ with the help of a linearization.
4. Consider the function f defined by $f(x) = \sqrt{4 + x}$. The Taylor polynomial of order 2 of f about $a = 0$ will be denoted by $p_2(x)$.
 - (a) Compute the Taylor polynomial $p_2(x)$.
 - (b) Approximate $\sqrt{4.08}$ with the help of $p_2(x)$.
 - (c) Give an estimation for the difference of $\sqrt{4.08}$ and the approximation from subpart (b).
5. Find the equation of the tangent line to the curve C , defined by the equation $x^2 - xy + 2y^2 = 8$, at the point $(2, -1)$.
6. Show that $\frac{1 - \tan^2(x)}{\tan^2(x) + 1} = \cos(2x)$.
7. Let $\varphi = \arctan(2x)$.
 - (a) Simplify $\cos(\varphi)$.
 - (b) Simplify $\sin(2\varphi)$.

Notation: $\arctan = \tan^{-1}$

see next page

8. Find the limits below.

(a) $\lim_{x \rightarrow 1/4} \frac{4x^3 - 5x^2 + x}{4x - 1},$

(b) $\lim_{x \rightarrow 1} \frac{(x - 1)e^x}{x^2 - x}.$

9. Compute $\int_1^4 e^{\sqrt{x}} dx.$

10. Consider the function f with $f(x) = e^x \sin(x).$

(a) Compute $\int_0^\pi f(x) dx.$

(b) Find the mean value of $f(x)$ on the interval $[0, \pi].$

11. The function F is defined by $F(x) = \int_0^{x^2} \frac{t^2 - 1}{2 + t} dt.$

Find $F'(x).$

Hint: do not compute the integral.

12. Compute the integral $\int_0^{1/2} \arccos(x) dx.$

The division of the points over the problems is as follows:

Problem 1: 3 points	Problem 4c: 2 points	Problem 8b: 1 point
Problem 2a: 2 points	Problem 5: 3 points	Problem 9: 3 points
2b: 2 points	Problem 6: 3 points	Problem 10a: 2 points
Problem 3: 3 points	Problem 7a: 2 points	10b: 1 point
Problem 4a: 1 point	7b: 2 points	Problem 11: 3 points
4b: 2 points	Problem 8a: 2 points	Problem 12: 3 points

The mark for the examination is obtained by dividing the total of scored points by 4 and by rounding off to an integer.
