

Trial Exam 2011 - First Half

Mathematics for Multimedia Applications
Medialogy

19. May 2011

Formalities

This trial exam set consists of 3 pages. There are 6 problems containing 18 sub-problems in total.

A number of points is indicated for every sub-problem. The sum of these points equals 56. At the exam, there will be more problems, including Linear Algebra problems, such that the points will sum up to 100. Thus this trial exam is *not* equivalent to a full exam set.

Date and time for the exam: 1. June, 9:00 -13:00

You must indicate the following on each page:

- Full name
- Study number
- Page number

On the first page, you must indicate

- The total number of pages.

Problems

Problem 1.

- 1.a. (3 points) Differentiate the function $\sqrt{x} \sin(x)$.
- 1.b. (3 points) Let $f(x) = 3 \sin(x^2 + 5)$. Calculate $f'(x)$.

Problem 2. Let $f(x) = 3 \cos(2x)$.

- 2.a. (2 points) Calculate $f'(x)$.
- 2.b. (3 points) Find an x such that $f'(x) = 0$.
- 2.c. (5 points) Find all x such that $f'(x) = 0$.

Problem 3. Consider the function $y(t) = A \sin(\omega t)$, where A and ω are constants.

- 3.a. (4 points) Let $\omega = 1$. Sketch the graph of $y(t)$, $0 \leq t \leq 2\pi$ for $A = 1$ and $A = 2$ in the same (t, y) -coordinate system.
- 3.b. (4 points) Let $A = 1$. Sketch the graph of $y(t)$, $0 \leq t \leq 2\pi$ for $\omega = 1$ and $\omega = 2$ in a new (t, y) -coordinate system.
- 3.c. (4 points) Calculate $y'(t)$ and $y''(t)$ for the function $y(t) = A \sin(\omega t)$.

Problem 4. Evaluate the following integrals:

- 4.a. (3 points) $\int_{-1}^1 (3x^2 + 8x + 1) dx$.
- 4.b. (3 points) $\int_0^{\pi/2} (\cos(x) + 2) dx$.
- 4.c. (3 points) $\int_1^3 \frac{1}{x} dx$.

Problem 5. Let P , Q and R be three points in 3D-space; P has coordinates $(1, 2, 0)$, Q has coordinates $(1, 4, 0)$ and R has coordinates $(4, 4, \sqrt{3})$.

5.a. (2 points) Find \overrightarrow{PQ} and \overrightarrow{PR} .

5.b. (2 points) Write parametric equations of the line that passes through P and Q .

5.c. (4 points) Find the angle between \overrightarrow{PQ} and \overrightarrow{PR} .

Problem 6. Let P , Q and R be three points in 3D-space; P has coordinates $(7, 2, 3)$, Q has coordinates $(8, 2, 2)$ and R has coordinates $(9, 5, 4)$.

6.a. (2 points) Find \overrightarrow{PQ} and \overrightarrow{PR} .

6.b. (3 points) Compute the cross product $\overrightarrow{PQ} \times \overrightarrow{PR}$.

6.c. (3 points) Find the area of the triangle with vertices P , Q and R .

6.d. (3 points) Find an equation for the plane through the three points P , Q and R .