**Exam MBLS-102 Mathematics 4-11-2024**

* Graphical calculator not allowed.
* Do not just provide answers: points are awarded for calculations.
* Time: 150 minutes.

**Task 1 Vectors**

Consider the vectors , and .

1. Compute .
2. Compute a vector perpendicular to both and .

**Task 2 Integration techniques & implicit differentiation**

1. Compute
2. Compute the implicit derivative , when

**Task 3 Differential equation**

Solve the differential equation

(on the domain ).

**Task 4 Complex numbers**

1. Compute (that is, write in the form with and real numbers).
2. Compute (that is, write in the form with and real numbers).

**Task 5 Maclaurin polynomial**

Compute the 2d degree Maclaurin polynomial of the function

**Task 6 Least squares**

Given are three data points : .

1. Determine the linear least-squares fit to the data, assuming the errors are only in . Show the details of your computation.
2. When you do a linear least squares fit with the roles of and reversed, do you obtain the same line? Why (not)? Argue from understanding, not from computation.

**Flip this page for the last task: task 7**

**Task 7 Functions of two variables**

Given the function ,

1. Compute the total differential
2. Solve when simultanuously and .