

MTH4102 Differential Equations

1pm, Thursday 1st April, 2010

Duration: 40 minutes

You should attempt all questions. Marks awarded are shown next to the question. Calculators are NOT permitted in this examination. The unauthorised use of a calculator constitutes an examination offence.

This is an OPEN BOOK test

permitted: any printed material, e.g. books
any handwritten notes
photocopies of any kind

prohibited: using electronic devices, e.g. calculators or mobile phones
sharing material with other students

YOU ARE NOT PERMITTED TO START READING THIS QUESTION PAPER UNTIL INSTRUCTED TO DO SO BY AN INVIGILATOR.

STUDENT NAME:

STUDENT NUMBER:

Problem 1

Find the general solution of the differential equation

$$y' = \frac{y^2 + 4x^2}{xy}$$

in explicit form.

(2 marks)

Problem 2

Given the initial conditions $y(0) = 1$ and $y'(0) = 1$, find the particular solution to the linear second-order differential equation

$$y'' - 6y' + 9y = 0.$$

(2 marks)

Problem 3

Find the particular solution to the inhomogeneous differential equation

$$y'' - 5y' + 6y = \sin x .$$

(2 marks)

Problem 4

Determine the particular solution to the inhomogeneous differential equation

$$2y'' + 3y' + y = e^{-x/2}.$$

(2 marks)

Problem 5

Determine the general solution of the system of linear differential equations

$$y_1' = 2y_1 + y_2, \quad y_2' = y_2.$$

(2 marks)

Maximum number of marks: 10

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End of Examination

