

**QUEEN MARY
UNIVERSITY OF LONDON
MID-TERM TEST 2007**

MAS/118 Differential Equations

1:00 pm, Wednesday 21st February, 2007

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.

Problem 1

Compute the indefinite integral

$$\int x \cos(x^2) dx$$

(2 points)

Problem 2

Solve the following differential equation by separation of variables and fix the constant of integration according to the given initial condition

$$y' = xy/(x-1), \quad y(0) = 2$$

(2 points)

Problem 3

Solve the following linear inhomogeneous differential equation and fix the constant of integration according to the given initial condition

$$y' = y + 2xe^{2x}, \quad y(0) = 3$$

(2 points)

Problem 4

Show that the following equation is an exact differential equation and determine the general solution

$$2xy^2 + 4x^3 + 2(x^2 + 1)yy' = 0$$

(2 points)

Problem 5

Compute the general solution of the linear second order differential equation

$$6y'' + 5y' - 6y = 0$$

(2 points)

Maximum number of points: 10

For the bonus problem turn over (it is not compulsory to work on the bonus problem)

Problem X

Determine the value of the derivative of the function $f(f(f(f(f(x)))))$ at $x = 0$, where $f(x) = 1 - 2x^2$.
(10 bonus points)