

OLLSCOIL NA hÉIREANN, GAILLIMH
THE NATIONAL UNIVERSITY OF IRELAND, GALWAY

SEMESTER I EXAMINATIONS, 2002/2003

SECOND UNIVERSITY EXAMINATION

MATHEMATICS [MA211] CALCULUS 1

PASS

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Time allowed: *Two* hours.
Full marks for *three* questions.

1. Solve the equations:

(a) $\frac{dy}{dx} = y^2(1 - y)$

(b) $\frac{dy}{dx} = \frac{2xy}{3y^2 - x^2}$

(c) $\frac{dy}{dx} + y = e^x$

2. Find the general solution of *two* of the following second order equations:

(a) $\frac{d^2y}{dx^2} - 2\frac{dy}{dx} = x^2 + x$

(b) $\frac{d^2y}{dx^2} - 6\frac{dy}{dx} + 9y = xe^{2x} + 2x$

(c) $\frac{d^2y}{dx^2} + 9y = x + \cos x$

3.

(a) Using $y = x^r$, find the general solution of the Euler equation

$$x^2 y'' - xy' + y = 0.$$

(b) Using $t = \ln x$, solve the equation

$$x^2 y'' + xy' + 4y = 0.$$

4. Use the method of variation of parameters

(a) to find a particular solution of the equation:

$$y'' + 4y = \frac{3}{\sin x}$$

OR

(b) to find a second solution of the equation:

$$4x^2 y'' - 4xy' + 3y = 0.$$

given that $y = \sqrt{x}$ is a solution.