MAT2384-Ordinary differential Equations and Numerical Methods-Fall 2010

MIDTERM EXAM (October 22, 2010)

Professor: Joseph Khoury **Duration: 80 minutes**

Last Name: _____

First Name: _____

Student Number: _____

(1) This is a closed book exam.

(2) Only basic scientific calculators are allowed. Graphing or programmable calculators are not permitted.

(3) The exam has 6 questions worth a total of 30 points.

(4) The exam has 9 pages.

(5) Please write your answers in a complete and clear way. You may use the back of the pages or the additional pages at the end if you need more space for your work.

(6) You must answer all the questions.

MAT 2384 C **Midterm Exam, October 22, 2010**

1. **[7 points]** Solve the Initial Value Problem:

$$(6xy^2 - 3x^2y^3 + 2y)dx + (9x^2y - 4x^3y^2 + 4x)dy = 0, \quad y(1) = 1.$$

2. **[4 points]** Solve the Initial Value Problem:

$$y' - \frac{2}{x}y = 2x^3, \qquad y(1) = 0.$$

3. **[4 points]** Give the general solution for each of the following ODEs:

(1) $y'' - 6y' + 9y = 0$

(2) $y'' - 4y' + 5y = 0$

4. **[5 points]** Solve the Initial Value Problem:

$$x^2y'' + xy' + 9y = 0, \quad x > 0, \ y(1) = 1, \ y'(1) = 3$$

5. [4 points] Give the general solution for the following ODE:

$$y''' + 3y'' - y' - 3y = 0.$$

6. **[6 points]** Use the **fixed point iteration** method to find the root of

$$x^4 - 7x + 3 = 0$$

in the interval $[0, 1]$ to 4 decimal places. Use $x_0 = 0.45$ and **make sure that the conditions for convergence of the iteration sequence are satisfied.**