MAP 2302 (Differential Equations)
TEST 2, Thursday March 25, 2010

Name: **PID:**

Remember that no documents or calculators are allowed during the test. You shall show all your work to deserve the full mark assigned to any question. Good luck.

1. [20] a) Given that $y = \sin(2x)$ solves the differential equation: $y^{\text{iv}} - 2y''' + 6y'' - 8y' + 8 = 0$, find the general solution.

2. [20] Use the method of undetermined coefficients to solve the differential equation:
$y'' + 6y' + 13y = e^x \sin x$

3. [10+20] a) Solve the Cauchy-Euler equation: $x^2y'' - xy' + 4y = 0$. Write the general solution in terms of the variable $x > 0$. b) Use the method of variation of parameters to find the general solution of the differential equation: $y'' + 4y' + 4y = x^{-4}e^{-2x}$.

4. [15] Find power series solutions in powers of x of the differential equation: $y'' + (x+1)y' + y = 0$. Write down the general solutions including powers of x up to x^3.

5. [15] Use the method of Frobenius to find two linearly independent series solutions of the form $x^r \sum_{n=0}^{\infty} a_n x^n$ to the differential equation equation $2x^2y'' + 3xy' + (4x - 6)y = 0, \quad 0 < x < R.$
(First find and solve the indicial equation, then for each indicial root, find a recurrence relation between a_n, and a_{n-1}. This will be enough.)