Math 221-02 Test 2 **Spring 2008**

Name:________________________ Score:__________________

Instructions: You must show supporting work to receive full and partial credits. No text book, notes, formula sheets allowed.

1(10pts) Change the equation $ty''(t) + (\sin t + 3t^2)(y')^2 = 5$ to a system of two 1st order equations.

2(10pts) The roots of the characteristic equation to the linear differential equation of constant coefficients $a_5y^{(5)} + a_4y^{(4)} + a_3y^{(3)} + a_2y'' + a_1y' + a_0y = 0$ include $0, 0, 1, 2 + 3i$. Find the general solution to the differential equation.

3(15pts) The linear differential equation of constant coefficients $a_3y^{(3)} + a_2y'' + a_1y' + a_0y = \sin x + 3xe^{4x}$ has $y_1 = e^{4x}, y_2 = \cos x$ as solutions to the homogeneous equation. Find a **FORM** for a particular solution to the nonhomogeneous equation.

4(15pts) Solve the initial value problem $y'' + 4y' + 13y = 0, y(0) = 2, y'(0) = 1$.

5(10pts) Find a general solution to the Euler's equation $2x^2y'' + 5xy' + y = 0$.

6(10pts) Find a general solution to the system of equations $x'(t) = \frac{1}{2}y(t), y'(t) = -8x(t)$.

7(15pts) Use the method of undetermined coefficients to find a particular solution to the equation $y' + 3y = 10e^x \cos(2x)$.

8(15pts) Use the method of variation of parameters to find a particular solution to the equation $x^2y'' - 2xy' + 2y = x^3e^{2x}$ given that $y_1(x) = x, y_2(x) = x^2$ are solutions to the homogeneous equation.

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