Math 221 Test 2 **Spring 2006**

Name:_____ Score:_____

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

1(15pts) Find a general solution to the equation $2y' + 3y = 2$.

2(15pts) It is known that the equation $y''' + 2y'' - 3y' - 10y = 0$ has a solution $y_1(x) = e^{2x}$. Find a general solution to the equation.

3(17pts) Use the method of variation of parameters to find a particular solution to the equation $x^2y'' + xy' - y = 6x^2$ for which two linearly independent solutions to the homogeneous equation are given as $y_1(x) = x,\ y_2(x) = 1/x$.

4(18pts) Use the method of undetermined coefficients to find a particular solution to the equation $y'' + 3y' - 4y = e^x$

5(15pts) Assume that the linear, homogeneous equation with constant coefficients $a_5y^{(5)} + a_4y^{(4)} + a_3y^{(3)} + a_2y'' + a_1y' + a_0y = 0$ has $x^2,\ e^x\cos(2x)$ as solutions.

(a) What must be the roots to the characteristic equation?

(b) Find the FORM of a particular solution to the nonhomogeneous equation $a_5y^{(5)} + a_4y^{(4)} + a_3y^{(3)} + a_2y'' + a_1y' + a_0y = 2e^x\sin(2x) + \cos(2x) + 32x$. (Do not solve for the coefficients.)

6(20pts) Find the solution to the initial value problem $y'' + 9y = \sin x,\ y(0) = 1,\ y'(0) = 0$.

2 pts Bonus: What does 'UNL' stand for other than the one we all know?

END