**Math 221 Test 2** **Fall 2006**

Name:_____ Score:_____

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

1(10pts) Find the solution to the initial value problem $u'' + 3u' + 2u = 0, u(0) = 0, u'(0) = 1$.

2(10pts) Find a general solution to the equation $u''' + 4u'' - 5u' = 0$.

3(10pts) Find a general solution to the Cauchy-Euler equation $t^2u'' + 2tu' - 6u = 0$.

4(10pts) If the roots of the characteristic equation of the homogeneous equation $au''' + bu'' + cu' + du = 0$ are $0, -1 \pm 2i$, find the FORM of a particular solution to the nonhomogeneous equation $au''' + bu'' + cu' + du = 4t + 5e^{-t}\sin(2t) - 2te^{-t}$. **Do not solve for the coefficients.**

5(15pts) Find a general solution to the linear differential equation $(t^2 + 1)\dfrac{du}{dt} + 2tu = 6t$.

6(15pts) Use Euler's method to find an approximating solution to the initial value problem $u' + tu = t^2, u(1) = 2$ in the interval $[1, 2]$ using a step size $h = 0.25$. Sketch the approximating solution.

7(15pts) Use the method of Undetermined Coefficient to find a particular solution to the equation $u'' + 9u = \sin(3t)$.

8(15pts) Use the method of Variation of Parameter to find a particular solution to the equation $(t^2-1)u'' - 2tu' + 2u = (t^2-1)^2$ for which two linearly independent solutions to the homogeneous equation are given as $u_1(t) = t, u_2(t) = t^2 + 1$.

**END**