Math 520 (Section 001)
Prof. Meade

University of South Carolina
Spring 2013

Exam 2
March 8, 2013

Name: ____________________
SS # (last 4 digits): __________

Instructions:

1. There are a total of 5 problems (including the Extra Credit problem) on 2 pages. Check that your copy of the exam has all of the problems.
2. You may bring one notecard (not a full sheet of paper) on which you have written (i) the factorization of one polynomial and (ii) the solution of one linear system.
3. No electronic or other inanimate objects can be used during this exam. All questions have been designed with this in mind and should not involve unreasonable manual calculations.
4. Be sure you answer the questions that are asked.
5. You must show all of your work to receive full credit for a correct answer. Correct answers with no supporting work will be eligible for at most half-credit.
6. Your answers must be clearly labeled and written legibly on additional sheets of paper (that I will provide). Be sure each sheet contains your name and the work for each question is clearly labeled.
7. Check your work. If I see *clear evidence* that you checked your answer (when possible) and you *clearly indicate* that your answer is incorrect, you will be eligible for more points than if you had not checked your work.

Problem	Points	Score
1	20	
2	20	
3	20	
4	20	
5	20	
Extra Credit	10	
Total	100	

Enjoy Spring Break!

1. (20 points) Consider the differential equation $t^2y''' + 8ty'' + (\tan t)y = \cos(t)$. *Do not attempt to solve this equation.*

   (a) What is the order of this differential equation? Is this differential equation linear or nonlinear? Does this differential equation have constant coefficients? Could you find a fundamental set of solutions to the corresponding homogeneous differential equation? Explain.

   (b) Determine the longest interval in which the solution to the initial value problem for this differential equation with the initial conditions $y(5) = 2$, $y'(5) = -1$, $y''(5) = 0$ is certain to have a unique solution.

   (c) What does Abel's Theorem tell us about the Wronskian of a fundamental set of solutions to this differential equation?

2. (20 points) Find the solution of the initial value problem

$$y'' + 2y' + 5y = 0, \quad y(0) = 2, \quad y'(0) = 4.$$

3. (20 points) Consider the differential equation $y'' - 6y' + 9y = \frac{e^{3t}}{t}$.

   (a) Find the general solution to the corresponding homogeneous equation.

   (b) Use the method of variation of parameters to find a particular solution.

4. (20 points) Find the solution of the initial value problem

$$2y^{(4)} - y''' - 9y'' + 4y' + 4y = 0, \qquad y(0) = y''(0) = 2, \quad y'(0) = y'''(0) = 0.$$

5. (20 points) Consider the differential equation

$$y^{(4)} + 4y'' = 3\sin(t) + 10te^t + 8.$$

   Determine a suitable form for a particular solution found by the method of undetermined coefficients. *Do not solve for the coefficients.*

Extra Credit (10 points) Determine a particular solution to the nonhomogeneous equation in #5.