

# Practice Exam for Exam 2, Math 3303, Spring 2007

Print Your Name: \_\_\_\_\_

**Direction:** Show all your work. Work without sufficient detail will not get full credits.

1. a) Find the general solution of  $y'' + 2y' + y = 0$ .

b) Using the method of undetermined coefficients, find a particular solution of  $y'' + 2y' + y = \sin x$ .

2. (3 points) Determine the number of solutions that the boundary value problem  $y'' + y = 0$ ,  $y(0) = 0$ ,  $y'(\frac{\pi}{2}) = 0$  has. (7 points) Justify your answer.

3. Find the general solution of  $y'' - y = e^{2x}$ .

4. Find the general solution of  $y'' - y = xe^x$ .

5. Find the correct form of a particular solution  $y_p$  when you solve  $y'' - y = xe^x + \sin x$  by the method of undetermined coefficients. *You do not need to solve this equation.*

6. Solve  $y'' + y = \sec^2 x$ .

7. Show that 1 and  $\tan x$  are linearly independent.

8. One knows the differential equation  $y'' - 2y' + y = 0$  has two linearly independent solutions  $y_1 = e^x$  and  $y_2 = xe^x$ . Use the reduction of order to derive  $y_2 = xe^x$  from  $y_1 = e^x$ .

You should begin by setting  $y_2 = uy_1 = ue^x$ . Then using the reduction of order, show that you could choose  $u = x$ . *If you do not use the reduction of order, you will get no credit.*