

Name: \_\_\_\_\_ ID Number: \_\_\_\_\_

**MTH Makeup**

**Exam 2**

**October 8-10, 2008**

*No calculators or any other devices are allowed on this exam.*

*Read each question carefully. If any question is not clear, ask for clarification.*

***Write your solutions clearly and legibly; no credit will be given for illegible solutions.***

***Answer each question completely, and show all your work.***

- 1.** (20 points) Find the solution  $y(x)$  to the initial value problem

$$y'' - 2y' + 10y = 0, \quad y(0) = 1, \quad y'(0) = 2.$$

#	Score
1	
2	
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- 2.** (20 points) Use the method of reduction of order to find a second solution  $y_2(x)$  of the differential equation

$$x^2 y'' + 2x y' - 2y = 0, \quad x > 0,$$

knowing that a solution of the above equation is  $y_1(x) = x$ .

- 3.** (20 points) Use the method of undetermined coefficients to find a particular solution  $y(x)$  to the inhomogeneous equation

$$y'' - 2y' + y = xe^{2x} + 4.$$

4. (20 points) Find the **recurrence relation** for the coefficients  $a_n$  of the power series expansion  $y(x) = \sum_{n=0}^{\infty} a_n (x - x_0)^n$  centered at  $x_0 = 0$  of the solution of the differential equation

$$(2 + x^2) y'' - x y' + 4y = 0.$$

You do not need to solve the recurrence relation.

**5.** (20 points) Find the general solution  $y(x)$  of the Euler equation

$$(x - 1)^2 y'' + 8(x - 1) y' + 12y = 0.$$