

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

**MTH 340**  
**Exam 2**  
**October 8, 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

$$y'' - 2y' + 5y = 0, \quad y(0) = 2, \quad y'(0) = 1.$$

#	Score
1	
2	
3	
4	
5	
$\Sigma$	

- 2.** (20 points) Use the method of undetermined coefficients to find the general solution  $y(x)$  of the inhomogeneous equation

$$y'' + 9y = 2 \sin(3x).$$

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

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

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  $x_0 = 2$  of the solution of the differential equation

$$2y'' - xy' - y = 0.$$

You do not need to solve the recurrence relation.

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

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