

Name: _____ ID Number: _____

MTH 235
Exam 2
October 7, 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

$$2y'' + 8y' + 10y = 0, \quad y(0) = 1, \quad y'(0) = 0.$$

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1	
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- 2.** (20 points) Use the method of undetermined coefficients to find the general solution $y(x)$ of the inhomogeneous equation

$$y'' + 4y = 3 \sin(2x).$$

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

$$(1 - x)y'' + xy' - y = 2(1 - x)^2e^x, \quad x \neq 1,$$

knowing that the functions $y_1(x) = e^x$ and $y_2(x) = x$ are solutions of the homogeneous equation

$$(1 - x)y'' + xy' - y = 0.$$

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 $x_0 = 3$ of the solution of the differential equation

$$2y'' + (x + 1)y' + 3y = 0.$$

You do not need to solve the recurrence relation.

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

$$x^2 y'' + 3x y' + 5y = 0.$$