Ma 2 practical - Written Homework #5
Due Monday, November 9, 2015 before 4pm

Name (Print):

Please write down the question number at the beginning of your solution. You can use this sheet as a cover.

1. (10 points) Section 3.4
   Use the method of reduction of order to find a second solution to the differential equation
   \[ xy'' - y' + 4x^3y = 0, \quad x > 0, \quad y_1(x) = \sin x^2. \] (1)

2. (10 points) Section 3.5
   Find the general solution of the differential equation
   \[ y'' + y' + 4y = 2\sinh t. \] (2)
   Recall that \( \sinh t = \frac{1}{2}(e^t - e^{-t}) \).

3. (10 points) Section 3.6
   Use the method of variation of parameters to find the general solution to the given differential equation
   \[ y'' + 4y' + 4y = t - 2e^{-2t}, \quad t > 0. \] (3)

4. (10 points) Section 3.6
   Verify the given functions \( y_1 \) and \( y_2 \) are the solutions to the corresponding homogenous differential equation, then find a particular solution to the nonhomogenous one.
   \[ (1 - t)y'' + ty' - y = 2(t - 1)^2e^{-t}, \quad 0 < t < 1; \quad y_1(t) = e^t, \quad y_2(t) = t. \] (4)

5. (10 points) Section 4.2
   Find the solution to the given differential equation
   \[ y''' - y'' + y' - y = 0, \quad y(0) = 2, \quad y'(0) = -1, \quad y''(0) = -2. \] (5)

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