MEMORIAL UNIVERSITY OF NEWFOUNDLAND

DEPARTMENT OF MATHEMATICS AND STATISTICS

ASSIGNMENT 5 **MATH 2260** SPRING 2019

Due: Wednesday, July 10th, 2019 at 1:00pm. SHOW ALL WORK.

1. Solve each of the following second-order equations.

   (a) $9\dfrac{d^2y}{dt^2} + y = 0$

   (b) $\dfrac{d^2y}{dt^2} - 2\dfrac{dy}{dt} + 5y = 0$

   (c) $\dfrac{d^2y}{dt^2} - 8\dfrac{dy}{dt} + 15y = 0$

   (d) $\dfrac{d^2y}{dt^2} + 8\dfrac{dy}{dt} + 16y = 0$

   (e) $2\dfrac{d^2y}{dt^2} + 11\dfrac{dy}{dt} + 12y = 0$

2. Solve each of the following initial value problems.

   (a) $\dfrac{d^2y}{dt^2} + 10\dfrac{dy}{dt} + 34y = 0, \quad y(0) = y'(0) = 2$

   (b) $4\dfrac{d^2y}{dt^2} - 28\dfrac{dy}{dt} + 49y = 0, \quad y(0) = 0, \quad y'(0) = -4$

3. For each of the following pairs of functions, use the Wronskian to determine if they represent a fundamental set of solutions for some second order differential equation.

   (a) $y_1 = \ln(t), \quad y_2 = \ln(t^2)$

   (b) $y_1 = \sin(t), \quad y_2 = \sin(2t)$

4. Given that y_1 is a solution of the given equation, use the method of reduction of order to find a second solution y_2 such that y_1 and y_2 form a fundamental set of solutions. Use the Wronskian to verify that this is the case.

   (a) $3t^2\dfrac{d^2y}{dt^2} - t\dfrac{dy}{dt} - 4y = 0, \quad y_1 = t^2$

   (b) $t^2\dfrac{d^2y}{dt^2} + 3t\dfrac{dy}{dt} + y = 0, \quad y_1 = \dfrac{1}{t}$

   (c) $2t^2\dfrac{d^2y}{dt^2} + 5t\dfrac{dy}{dt} - 2y = 0, \quad y_1 = \sqrt{t}$