Homework 10 and Study Problems - MATH 225

In this document, you will find two types of problems: homework and study problems. You are required to submit **only the homework problems** to Gradescope. The study problems are intended to help you grasp the topics thoroughly and prepare for exams. It is strongly advised to attempt all study problems for a comprehensive understanding.

Please submit your homework to Gradescope until **April 28, 11pm**.

Homework problems

1. Find the general solutions to given equations via **integrating factor method**:

   (a) $y' - 2xy = 2xe^{-x^2}$

   (b) $y' - 2y = x^2 e^{2x}$, note that this can be solved via also the annihilator method, but we asked for integrating factor. As an exercise, you can solve in both ways.

2. Solve the given IVPs via **integrating factor method**:

   (a) $x^3 y' + 4x^2 y = e^{-x}$, $y(-1) = 0$.

   (b) $xy' + 2y = x^2 - x + 1$, $y(1) = \frac{1}{2}$.

3. (a) Find the general solutions to the given constant coefficient **homogeneous** ODE :

   $$(D^2 + 2D + 10)y = 0.$$

   (b) Solve the IVP related to the given constant coefficient **homogeneous** ODE:

   $$y''' + 2y'' - 4y' - 8y = 0, \quad y(0) = 0, y'(0) = 6, y''(0) = 8.$$

4. Find the general solutions to the given constant coefficient **non-homogeneous** ODEs using the **annihilators**:

   (a) $y'' + 4y' + 4y = 5xe^{-2x}$.

   (b) $y''' + 3y'' + 3y' + y = 2e^{-x} + 3e^{2x}$.

5. Solve the IVP related to the given constant coefficient **non-homogeneous** ODE:

   $$y''' + 4y' = x, \quad y(0) = 0, y'(0) = 0, y''(0) = 1.$$

Study problems

1. The study problems are already given in the practice sheet for final exam.