

MATH 267 Section E1 Practice Midterm

Problem 1 (7 points) Check whether the following differential equation is exact or not.

$$x + y \frac{dy}{dx} = 0.$$

Problem 2 (7 points) Assume you have a differential equation

$$M(x, y) + N(x, y) \frac{dy}{dx} = 0.$$

Assume it is not exact. Explain the concept of integrating factor and how it can be used to make solve the equation.

Problem 3 (7 points) What is a fundamental set of solutions of a homogeneous linear n -th order differential equation? And how do you use it to write the formula for the general solution?

Problem 4 (7 points) Calculate the Wronskian associated to the three functions e^t , e^{2t} , e^{-t} at the point $t = 0$.

Problem 5 (7 points) Give a particular solution of the equation

$$y''' + y = te^t,$$

using the method of undetermined coefficients.

Problem 6 (7 points) Give an example of a second order, linear, constant coefficients, homogeneous equation for which all the solutions go to zero as $t \rightarrow \infty$.

Problem 7 (7 points) Use Euler Formula to calculate

$$3e^{i\frac{\pi}{4}}.$$