MATH 3430-02 EXAM I GUIDE

In this note I want to make clear my expectations for midterm I, so that you know what to emphasize in your review.

The range is from **lecture [1-1] to [5-3]**. There will be **4** or **5** questions.

We can divide the topics into two parts, as follows.

1. First order ODEs.

a. You should know how to identify a first ODE as either **linear**, **separable**, or **exact**. [1-1], [1-2], [2-1]

b. You are expected to be able to solve an initial value problem of a 1-st order ODE of the 3 types listed in **a**.

c. Given a first order ODE and a specified rectangle around the initial point, use the Existence and Uniqueness theorem to find an 'existence interval'. [2-2 part]

d. You should be able to use the Euler's method to approximate a solution. [3-1]

e. You should be able to apply Picard's iteration for a few steps. [2-2 part]

(Having written these, I've left out the applications of 1st order equations [1-3], the integrating factors to turn an equation into exact form [2-1 part], and the error estimate of Euler's method [3-2]. This is because the list above represents the very basics that you should know.)

2. Second Order ODEs.

f. You should know when a 2nd order ODE is **linear**, **homogeneous** (defined only for linear equations), or **with constant coefficients**. [4-1]

g. You should be able to solve all 2nd order constant coefficient homogeneous IVPs (char. poly., 3 cases). [4-3], [5-1]

h. When you are given the form of a particular solution, you should be able to solve any 2nd order constant coefficient IVP, homogeneous or not. [5-3]

i. Given a 2nd order homogeneous linear ODE, when you are given one nonzero solution, you should be able to use the method of Reduction of Order to find another solution that's linearly independent of the given one. [5-2]

j. You should know when a differential operator L is linear. [4-2]

k. You should know how to use the Wronskian to check linear independence of a list of functions. [4-1]

I hope this list could help.