

Review for Exam 1
MATH 333
Fall 2009

This exam will cover Chapter 1-3 (up to 3.1). You should be able to handle the items in the following list:

1. Check whether a function or parameter family of functions is the solution of a differential equations. Find the domain of definition and intervals of solution. (1.1)
2. Classify differential equations by type, order and linearity. (1.1)
3. Find an interval of the solution of an IVP. Find the parameters in a parameter family of solutions, which give the solution of an IVP. (1.2)
4. Do the qualitative analysis of an autonomous first order DE. (2.1)
5. Use separation of variables to find parameter families of solutions or solutions of separable first order IVP. (2.2)
6. Use the method *Solving a linear first order equation* to find parameter families of solutions and solutions of IVPs. (2.3)
7. Check whether a DE $M(x, y)dx + N(x, y)dy$ is exact and if yes solve the DE by finding $f(x, y)$ with $f_x = M$ and $f_y = N$ such that $f(x, y) = c$ is a parameter family of solutions. Find solutions of IVPs using this method. (2.4)
8. Use multiplication by some integrating factor $\mu(x) = e^{\int \frac{My - Nx}{N} dx}$ respectively $\mu(y) = e^{\int \frac{Nx - My}{M} dy}$ (the formulas for the integrating factors will be given in the problem if needed.)
9. Solve (i) homogeneous equations, (ii) Bernoulli equations and (iii) equations $\frac{dy}{dx} = f(Ax + By + C)$ using suitable substitutions (i) $y = ux$ or $x = vy$, (ii) $u = y^{1-n}$, (iii) $u = Ax + By + C$. (the formulas for substitutions will be given in the problem if needed) (2.5)
10. Approximate solutions of IVPs using Euler's method. (2.6)
11. Solve an IVP from a linear model for population growth, radioactive decay, series circuits, falling with air resistance. (Specific physics formulas will be given in the problem if needed.) (3.1)

The main focus will be on the solution methods in Chapter 2 and the modeling examples in the first section of Chapter 3. Here are some important problem packages you might want to work on: 2.1: 21-28, 2.2: 1-30, 2.3: 1-30, 2.4: 1-38, 2.5: 1-20, 23-28, 2.6: 1-4, 3.1: 1-10, 29-38

No calculators or any other tools are allowed on this test

You will get copies of two front cover pages *Review of Differentiation* and *Brief Table of Integrals* for the exam. There will be eight problems on the test. One of the problems will ask you to explain a *definition* of a concept.