

## Exam 1 Review

This review sheet contains this cover page (a checklist of topics from Chapters 1 and 2). Following by all the review material posted so far this quarter in the order we used them (all combined into one file).

- Ch. 1: Differential Equation Basics
  - How do you check a solution?
  - What is a slope field? How do you recognize that a slope field matches a differential equation?
  - What are basic translation tools for applied problems?
- 2.1: Integrating Factor Method. Only for linear equations! Write in form  $\frac{dy}{dt} + f(t)y = g(t)$ . Then multiply by the integrating factor  $e^{\int p(t) dt}$  and simplify. Then integrate to get your answer.
- 2.2: Separable Equations. Factor and write in the form  $f(y)dy = g(x)dx$ . Integrate both sides!
- 2.3: Applications:
  - Know the homework problems!
  - Be able to set up mixing problems, Newton's law of cooling, financial problems, air resistance, and population problems.
  - Know basic language and how to translate ('proportional to', 'rate').
  - For more complicated applications, the differential equation will be given. Be able to solve the equation and be able to read the question carefully to get initial conditions.
- 2.5: Autonomous equations. Always find equilibrium solutions first!!! Know how to find and classify equilibrium solutions (stable, unstable, semistable). Also know basic population applications.
- 2.7: Euler's method. Understand how to do Euler's method. On a test I might ask you to do 3 or 4 steps of Euler's method on a given problem. You should be able to do this.

Other skills:

- Be able to integrate! Any integration method you have seen in the homework, test preps or lecture is fair game on the test. That includes: by parts, substitution and partial fractions (and a bit of trig).
- Be able to check your work. What does it mean to have correctly found a solution to a differential equation?
- Terminology: Do you know what I mean when I say a differential equation is first order, nonlinear/linear, or autonomous?