## Mathematics 255—January 2, 1996

**Instructor:** Bill Casselman
**Office:** Mathematics 215
**Telephone:** 822-4516
**Office hours:** Monday 3:30. Also by appointment.

**Text:** None required. I will pass out lecture notes regularly throughout the term. You may want to acquire a copy of the text book the other sections are using, which is

Boyce & DiPrima, *Elementary Differential Equations and Boundary Value Problems*, Fifth Edition.

**Examinations:** There will be at least two mid-term examinations and a few small (perhaps unannounced) quizzes, as well as a final examination. I do not know dates yet. *Examination grades will be counted proportionally to the length of time allotted to the examinations.* It is not clear whether our section will have our final examination in common with the other sections. In my section's examinations calculators will be required, and usually — but not always — crib sheets will be allowed.

**Assignments:** Homeworks will be due roughly every week. They will not generally be accepted late, because usually answers will be discussed in class. I am not sure exactly how homework will be counted towards your grade (certainly, not much) except that

- (•) if you do essentially all the homework, you get special consideration in otherwise failing circumstances;
- (•) you do not have to do any homework if your other grades are exemplary. But *most examination questions will be based directly on homework problems*, and you will certainly suffer if you have not made a serious effort to do them (by yourself!).
- (•) certain of the homeworks may be counted more than others. I will signal this when I hand out the assignments.

**Rough outline:**

- Introduction
  - First order equations
  - slope fields
  - rough numerical approximations
  - stability
  - linear equations
  - complex exponential functions
  - linear approximations near stability
- Numerical methods
  - Euler's
  - improved Euler's
  - Runge-Kutta
  - estimate of errors
  - choosing step size
- Second order equations
  - numerical methods
  - homogeneous linear equations
  - inhomogeneous linear equations
  - steady state
  - resonance
  - phase plane
- Linear systems
  - review of eigenvalues

systems with constant coefficients
trajectory diagrams
stability

You are expected to use computers in the numerical work. Ideally, you will do a small amount of programming for this part. Any language is acceptable. Those without access to computers will be required to do shorter work by hand. Any programming language will be acceptable, even one for a programmable calculator, and grades in this part of the course will depend on effort rather than programming skill. In particular, *examinations will not require any programming*. They will, however, require that you understand the methods presented in class for the programming assignments.

**Remark.** Especially because there is no required text, it is extremely important that you make an effort to understand the material as it is presented in class. I feel that it is an important part of your education to learn how to ask questions when you do don't understand something. Keep in mind that if you are confused, the chances are very good that others are too, and that you will be doing a service to them and to yourself by asking questions in public.