AMath 585
Winter Quarter, 2020

Review for Midterm

The midterm will be on Wednesday, February 12.

You will **not** need a calculator or computer.

One page (8.5 by 11 inch, single side) of **handwritten notes** will be allowed.

The midterm will cover finite difference methods for two-point boundary value problems and elliptic equations.

Note that there are additional exercises available on the book webpage.

Some things you might want to review:

- Chapters 1–3 and the relevant parts of Appendices A–C.
- Derivation of a method of a given form with specified order — finding the coefficients.
- Definitions of local truncation error, global error, order of accuracy, convergence, stability, etc.
- Relation of local to global error. "Fundamental theorem" on consistency + stability implies convergence.
- Approaches to showing a method is stable. Definition of matrix and vector norms.
- Green's functions and relation to inverse matrix.
- Derivation of finite difference approximations of arbitrary order on uniform or nonuniform grids. Developing a finite difference method for a given boundary value or elliptic problem.
- Determining order of accuracy from numerical results.
- Newton's method for nonlinear problems — setting up a nonlinear system $G(U) = 0$ and determining the Jacobian matrix and right-hand side for each iteration.