MATH 645:571-572 COMPUTATIONAL MATHEMATICS

COMP EXAM STUDY GUIDE - SPRING 2017

General Information

1. Internal representation using IEEE floating-point formats.
2. Errors: truncation, round-off, inherent, ill-conditioned problems.
3. Loss of significance: how to avoid it, examples.

Interpolation

1. Statement of existence and uniqueness theorem for polynomial interpolation.
2. Newton form of interpolating polynomial.

Root-Finding Methods

1. Newton's Method: derivation, application, and result of convergence analysis.

Numercial Integration

1. Trapezoidal Rule.
2. Simpson's Rule.
3. Improper Integrals.

Systems of Linear Equations

1. Gaussian Elimination and PLU-factorization for 3x3 systems.
2. Scaled partial pivoting.
3. Computation of inverses and determinants.
4. Idea of iterative improvement. Be able to explain the algorithm and apply it to a 2x2 system.

Ordinary Differential Equations - IVPs

1. Idea behind Runge-Kutta methods.
2. Reduction of higher-order equations to first-order systems.