

Math 4650 Midterm Review Topics

- 1.1: Understand Taylor's theorem and how to use it, particularly the error term.
- 1.2: Understand roundoff error, where it's most likely to crop up, and how to minimize it.
- 1.3: Understand "big oh" notation.
- Chapter 2: Know bisection, Newton's method, the secant method, and the method of false position (regula falsi). Understand the benefits and drawbacks of each.
- 2.2 and 2.4: Understand fixed-point iteration, and how to determine the order of convergence and asymptotic error constant.
- 2.5: Understand the idea behind accelerating convergence, and how to derive Aitken's formula.
- Chapter 3: Understand when to use interpolation and when not to; understand why interpolation tends to be poorer at the endpoints and how to compensate for that; understand the role and uses of splines.
- 3.1: Understand the Lagrange polynomial, the error formula, and how to use it.
- 3.2: Know how to compute divided differences and how they are used to get the interpolating polynomial.
- 3.3: Understand the relationship between Taylor polynomials and Lagrange polynomials. Know what Hermite polynomials are, and how to get them from a modified divided difference table.
- 4.1: Know how to derive a formula to estimate the derivative; understand the relationship between the number of points and the expected error; and understand the role of roundoff error and the optimal h to use.
- 4.2: Understand how to use Richardson's extrapolation to eliminate low-order error terms.
- 4.3: Know the basic Newton-Cotes formulas and how they are derived. Understand the relationship between the number of sampling points and the expected error.
- 4.4: Know the composite Simpson, midpoint, and trapezoid rules, and how to use the error terms.