

Summary of Topics

1. Error Analysis
 - (a) Roundoff errors (floating point arithmetic).
 - (b) Condition number and stability.
2. Interpolation
 - (a) Polynomial interpolation
 - i. **Lagrange form.**
 - ii. Newton divided difference form.
 - iii. **Difference tables.**
 - iv. **Gregory–Newton form.**
 - (b) **Error (next term rule, derivative rule).**
 - (c) **Polynomial wiggle problem.**
 - (d) Spline interpolation (linear splines, cubic splines).
3. Numerical differentiation and integration
 - (a) **Order notation.**
 - (b) Numerical differentiation (forward, central and backward finite difference approximations).
 - (c) Numerical integration.
 - i. **Newton–Cotes rules: (Composite) Trapezoid Rule, (Composite) Simpson’s rule.**
 - ii. **Gaussian quadrature.**
 - iii. **Richardson extrapolation.**
 - iv. Singular integrals.
4. Ordinary Differential Equations
 - (a) Initial Value Problems
 - i. **Euler’s methods, θ –method.**
 - ii. Runge–Kutta methods
 - iii. Predictor–corrector methods.
 - iv. **Explicit versus implicit methods, truncation error analysis, stability analysis.**

The Test

The test consists of three questions. The items in bold on the preceding list should be emphasized in preparing for the exam, but the other items should not be ignored. Questions will deal with theory (*not programming*), however some simple calculations will be required. Please bring the McMaster standard calculator (Casio FX-991). No notes shall be taken into the test.

Office hours

I will also be available by appointment (x23412) during reading week.