NE 155, midterm 1 review S21
March 4, 2021

Here are the topics we've covered and that are fair game for the exam.

The exam will be takehome and open book.
You may use a calculator, wolfram alpha, or python/matlab.
You **must** submit all of your work, including wolfram alpha solves (screenshot it) or python, etc.

- Transport and diffusion equation
  - meaning of terms
  - assumptions in derivation
  - areas of applicability and validity
  - boundary and interface conditions
- Interpolation
  - what it is and what it's for
  - polynomial (Lagrange based): formula and error calculation
  - what we think about when evaluating interpolation quality
  - piecewise polynomials
- Approximation using least squares
  - what it is and what it's for
  - the normal equations
- Differentiation: Forming expressions for derivatives and their error terms using Taylor's theorem; orders of accuracy as a function of mesh size ($O(h^x)$)
- Integration
  - Lagrange form of Newton-Cotes
  - composite Newton-Cotes
  - both how you derive these rules and compute the errors

  - quality of integration
  - closed vs. open NC
- Vectors and properties
  - vector norms
  - measuring error and determining convergence
- Matrices and properties
  - how to compute a determinant; properties of determinants