# MAT 325 Computational Mathematics Final Review - Revised April 26, 2022

- Be familiar with terminology.
- Know key algorithms and their use.
- Work with floating point sets.
- Find absolute or relative error.
- Work with relative condition number.
- Stability of quadratic formula.
- Know matrix types and operations.
- Carry out Gaussian elimination.
- Work with asymptotic limits.
- Count flops.
- Determine vector and matrix norms.
- Relate residual and backward error.
- Fit linear, exponential, power law data.
- Identify matrix types - orthogonal, hermitian, symmetric, transpose, etc.
- Apply conditioning to rootfinding problems.
- Predict convergence to fixed point.
- Apply Newton's and secant methods.
- Describe approaches to solving nonlinear systems.
- Explain the differences between square and overdetermined linear/nonlinear systems.
- Find misfit functions data fitting.
- Interpolate small data set.
- Explain cubic splines.
- Compute finite difference approximations and truncation errors for derivatives.
- Find/apply a Newton-Cotes quadrature formulas.
- Know difference between interpolation and extrapolation.
- Solve simple initial value problems.
- Implement Euler's Method to solve IVPs.
- Convert ODE to system of ODEs.
- Identify other methods for solving ODEs.
- Work with adjacency matrices.
- Solve eigenvalue problems.
- Eigenvalue decomposition, EVD.
- Spectral Decomposition Theorem.
- Quadratic forms for conics.
- Singular Value Decomposition.
- Symmetry and EVD & SVD.
- Rayleigh Quotient.
- Pseudo-random Number Generator.
- Middle square method. Linear Congruential Generator.
- Mersenne Twister.
- Mersenne prime.
- Uniform, Normal, Gaussian distribution.
- Box-Muller Method.
- Mean, Variance, Standard Deviation.
- DFT vs FFT.
- Analog vs digital.
- Periodogram.
- Nyquist rate.
- What are the top algorithms of the last century?
- more may be added