1. Terminology
   - adaptive integration
   - bisection method
   - bracketing
   - Broyden's update
   - cardinal functions
   - cubic spline
   - discretization
   - extrapolation
   - finite difference
   - fixed point iteration
   - fixed point problem
   - Gauss–Newton method
   - golden ratio
   - hat functions
   - interpolation
   - interpolant
   - inverse interpolation
   - Jacobian matrix
   - Levenberg's method
   - linear convergence
   - misfit function
   - Newton's method
   - Newton–Cotes formula
   - nonlinear least squares problem
   - Nodes
   - order of accuracy
   - piecewise linear interpolation
   - piecewise polynomial
   - Quasi-Newton methods
   - quadratic convergence
   - quadrature
   - residual
   - rootfinding problem
   - secant method
   - simple root
   - Simpson's rule
   - steepest descent
   - superlinear convergence
   - trapezoid formula
   - truncation error
   - weights - Fornberg and quadrature
2. Algorithms
   - Bisection
   - Fixed point iteration
   - Newton's method
   - Secant method
   - Multidimensional Newton Iteration, $J(x_k)\mathbf{s}_k = -\mathbf{f}(\mathbf{x}_k)$
   - Quasi-Newton Methods,
     - Finite difference $J(\mathbf{x}) \approx \dfrac{\mathbf{f}(\mathbf{x}+\delta\mathbf{e}_j)-\mathbf{f}(\mathbf{x})}{\delta}$
     - Broyden's update, $A_k \approx J(\mathbf{x}_k)$, $A_{k+1} = A_k + \dfrac{\mathbf{f}_{k+1}-\mathbf{f}_k - A_k\mathbf{s}}{\mathbf{s}_k^T\mathbf{s}_k}\mathbf{s}_k^T$
   - Linear interpolation $p(x) = y_k + \frac{y_{k+1}-y_k}{t_{k+1}-t_k}(x-t_k)$, $x \in [t_k, t_{k+1}]$
   - Hat function interpolant $p(x) = \sum_{k=0}^{n} c_k H_k(x)$.
   - Forward and backward finite differences
   - Centered finite differences
   - Fornberg's algorithm
   - Trapezoidal formula
3. Be able to
   - Apply conditioning to rootfinding problems.
   - Create a cobweb diagram.
   - 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.
   - Describe role of λ in Levenberg method, $(A_k^TA_k + \lambda I)\mathbf{s}_k = -A_k^T\mathbf{f}_k$.
   - Explain role of misfit function in nonlinear data fitting.
   - Interpolate small data set.
   - Explain conditions leading to cubic splines.
   - Compute finite difference approximations and truncation errors for derivatives.
   - Find a Newton-Cotes quadrature formula.
   - Relate Trapezoid to Simpson methods.