- Review all checkpoint questions from Steps 1-13, 16-23, 26-27, 29-33.
- Review homeworks 1 to 5 and be prepared to perform simple calculations related to
  - Significant digits, relative error, rounding error.
  - Propagated error, generated error.
  - Bisection, secant and Newton methods.
  - Matrix norms $||A||_\infty$ and $||A||_1$.
  - How to create a difference table.
  - Use a difference table to find an interpolating polynomial.
1. Be able to state Newton's method for solving f(x)=0.
2. Know the statement and proof of Taylor's Theorem.
3. Know the statement and proof of the polynomial interpolation theorem.
4. Know the proof of the rate of convergence of Newton's method.
5. State the Gauss-Seidel method for solving Ax=b and explain what kinds of matrices A are appropriate for using this method.
6. State the power method for finding the eigenvalue of largest magnitude and a corresponding eigenvector.
7. The definition of the Lagrange polynomial basis functions. $l_j(x) = \frac{\prod_{i \neq j} (x - x_i)}{\prod_{i \neq j} (x_j - x_i)}$
8. The definition of the condition number of a matrix.
9. Know how to use the condition number for backward error analysis.
10. Know how to prove that the matrix norm $||A||_2 = \max\{ ||Ax||_2 : ||x||_2 \leq 1 \}$ corresponding to the Euclidian norm is given by $||A||_2 = \max\{ \lambda^{1/2} : \lambda \text{ is an eigenvalue of } A^T A \}$.
11. Given a matrix A find the Householder reflector for the first step in the QR factorization. $H = I - 2vv^T \quad v = \frac{a_1 - ce_1}{\|a_1 - ce_1\|} \quad c = \pm \|a_1\|$
12. State Simpson's method for approximating a definite integral.
13. Prove the n-point Gauss quadrature method is exact for polynomials of degree 2n-1.
14. Use Taylor series to derive the n-th order Taylor method.

$$y(x_{n+1}) \approx y(x_n) + h y'(x_n) + \frac{h^2}{2} y''(x_n) + \frac{h^3}{6} y'''(x_n)$$

$$y' = f(x,y)$$

$$y'' = \frac{d}{dx} f(x,y) = f_x(x,y) + f_y(x,y) f(x,y)$$

$$y''' = \frac{d}{dx}\left(f_x(x,y) + f_y(x,y) f(x,y) \right)$$