1. Secant: $x_{k+1} = x_k - \frac{x_k - x_{k-1}}{f(x_k) - f(x_{k-1})} f(x_k)$, $k = 1, 2, \ldots$
2. Newton: $x_{k+1} = x_k - \frac{f(x_k)}{f'(x_k)}$, $k = 0, 1, \ldots$

   or $x_{k+1} = x_k - m\frac{f(x_k)}{f'(x_k)}$, $k = 0, 1, \ldots$, for $f(x) = (x-r)^m h(x)$, $h(r) \neq 0$.
3. Fixed-Point Iteration: $x_{k+1} = g(x_k)$, $\; k = 0, 1, \ldots$
4. norms for $\mathbf{x} \in \mathbb{R}^n$: $||\mathbf{x}||_1 = \displaystyle\sum_{i=1}^{n} |x_i| \qquad ||\mathbf{x}||_\infty = \max_{i=1}^{n} |x_i| \qquad ||\mathbf{x}||_2 = \left(\sum_{i=1}^{n} x_i^2 \right)^{1/2}$
5. norms for $A \in \mathbb{R}^{n \times m}$:

$$||A||_1 = \max_{j=1}^{m} \sum_{i=1}^{n} |a_{ij}| \qquad ||A||_\infty = \max_{i=1}^{n} \sum_{j=1}^{m} |a_{ij}|$$

$$||A||_f = \left(\sum_{i=1}^{n} \sum_{j=1}^{m} a_{ij}^2 \right)^{1/2} \qquad ||A|| = \max_{||\mathbf{x}||=1} ||A\mathbf{x}||$$

6. condition number $\mathrm{cond}(A) = ||A|| ||A^{-1}||$ for $A\mathbf{x} = \mathbf{b}$, $\mathbf{r} = \mathbf{b} - A\bar{\mathbf{x}}$:

$$\frac{||\mathbf{r}||}{||\mathbf{b}||} \frac{1}{||A|| ||A^{-1}||} \leq \frac{||\mathbf{x} - \bar{\mathbf{x}}||}{||\mathbf{x}||} \leq ||A|| ||A^{-1}|| \frac{||\mathbf{r}||}{||\mathbf{b}||}$$

$$\frac{||\mathbf{x} - \bar{\mathbf{x}}||}{||\mathbf{x}||} \leq ||A|| ||A^{-1}|| \frac{||E||}{||A||}, \quad E = A - \bar{A}$$

   for A: $A^T = A$, with $A\mathbf{v}^{(i)} = \lambda_i \mathbf{v}^{(i)}$, and $|\lambda_1| \geq |\lambda_2| \geq \cdots \geq |\lambda_n|$:

$$||A||_2 = |\lambda_1| \qquad ||A^{-1}||_2 = |\lambda_n^{-1}| \qquad ||A||_2 ||A^{-1}||_2 = \left| \frac{\lambda_1}{\lambda_n} \right|$$

7. Newton for $f_1(\mathbf{x}) = 0$, $f_2(\mathbf{x}) = 0$, $\ldots$, $f_n(\mathbf{x}) = 0$:

$$\begin{bmatrix} \frac{\partial f_1}{\partial x_1} & \frac{\partial f_1}{\partial x_2} & \cdots & \frac{\partial f_1}{\partial x_n} \\ \frac{\partial f_2}{\partial x_1} & \frac{\partial f_2}{\partial x_2} & \cdots & \frac{\partial f_2}{\partial x_n} \\ \vdots & \vdots & \ddots & \vdots \\ \frac{\partial f_n}{\partial x_1} & \frac{\partial f_n}{\partial x_2} & \cdots & \frac{\partial f_n}{\partial x_n} \end{bmatrix} \Delta\mathbf{x} = - \begin{bmatrix} f_1(\mathbf{x}) \\ f_2(\mathbf{x}) \\ \vdots \\ f_n(\mathbf{x}) \end{bmatrix}, \qquad \mathbf{x}^{(k+1)} = \mathbf{x}^{(k)} + \Delta\mathbf{x}, \quad k = 0, 1, \ldots$$

8. Eigenvalue problem: $A\mathbf{x} = \lambda\mathbf{x}$