(1) Digit-Number definition with base b:
$m = d_n\, d_{n-1}\, \ldots d_1\, d_0 \,.\, d_{-1}\, \ldots\, d_{-m}$

(2) Converting from base b to base 10:
$N_{10} = b^{-m} \cdot \sum_{k=0}^{n+m} d_{k-m} \cdot b^k$

(3) Converting from base 10 to b:
$x = int(x) + dec(x)$
$int(x) \uparrow, \quad dec(x) \downarrow$

(4) Representation of binary number:
$x = (-1)^s \cdot m \cdot b^e, \quad \text{where:}\, e \in [L, U]$
$m = 0.\, c_1\, c_2\, \ldots c_t$, $b =$ baza
$t =$ dolžine mantise, $c_i = i$-ta števka
$P(b, t, L, U) =$ representation set
osnovna zaok. napaka: $u = \frac{b^{1-t}}{2}$

(5) IEEE Rounding for $b = 2$:

$c_{(t+1)}$	$c_{(t+2)}$	Round Up
0	0	Never
0	1	Never
1	0	if $c_t = 1$
1	1	Always

(6) IEEE standards, $\circ \in \{+, -, \cdot, /\}$:
$fl(\cdot)$ - floating point evaluation
$fl(x \circ y) = (x \circ y)(1 + \delta),\ |\delta| < |u|$
$fl(\sqrt{x}) = \sqrt{x}(1 + \delta),\ |\delta| < |u|$

(7) Absolute & Relative Error:
$\Delta x = |x - \hat{x}|, \quad \delta = \frac{|x - \hat{x}|}{|x|}$

(8) Errors types:
$D_n = |y - \overline{y}|$, $D_m = |\overline{y} - \tilde{y}|$, $D_z = |\tilde{y} - \hat{y}|$

(9) Stability problems:

- Odštevanja števil enake velikost
- Deljenje s števili blizu 0

(10) Relative-Stability definitions:
Direktna: $|\delta| = |\frac{fl(x) - x}{x}| \leq C \cdot u \subseteq \mathcal{O}(u)$
Obratna: $fl(f(x)) = f(\tilde{x}),\ |\tilde{x} - x| \leq \mathcal{O}(u)|x|$
Pri obratni stabilnosti, preverimo ali lahko vsako napako interpretiramo kot perturbacijo vhoda.

(1) **Fixed point iteration** :

$f(x) = 0,$ use $g(x_r) = x_{r+1}$ or $g(x) = x + f(x)$
α_i je i-ta ničla funkcije f
Privlačne točke: $|g'(x)| < 1$
Odbojne točke: $|g'(x) > 1$
Neznana situacija: $|g'(x)| = 1$
Error es. : $|x_{r+1} - \alpha| \leq \frac{m}{1-m}|g(x_r) - g(x_{r-1})|$
$m = \sup_{x \in I} g'(x) < 1,$ g je skrčitev, $\alpha \in I$
Red konvergence je prvi odvod: $g^{(n)}(\alpha) \neq 0$
Konvergenca:

- $x_{r+1} - x_r = f(x_r) > 0, \quad \forall r : x_r < \alpha$
- $x_{r+1} - x_r = f(x_r) < 0, \quad \forall r : x_r > \alpha$

(2) **Newton-Rapson Method:**

$g(x_r) = x_{r+1} = x_r - \frac{f(x_r)}{f'(x_r)}$
$g^{'}(x_r) = \frac{f(x) \cdot f^{''}(x_r)}{(f^{'}(x_r))^2}$
Red Konvergence:
Ničla $= \alpha$, kratnost ničle $= m_\alpha$

- $m_\alpha = 1 \implies$ vsaj kvadratnična
- $m_\alpha > 1 \implies \lim_{x \to \alpha} g^{'}(x) = 1 - \frac{1}{m}$

Konvergenca:

- $x_{r+1} - x_r = \frac{f(x_r)}{f'(x_r)} > 0, \quad \forall r : x_r < \alpha$
- $x_{r+1} - x_r = \frac{f(x_r)}{f'(x_r)} < 0, \quad \forall r : x_r > \alpha$

(3) **Modified Newton-Rapson Method:**

$G(x_r) = x_{r+1} = a \cdot x_r - b\frac{f(x_r)}{f'(x_r)}$
$G^{'}(x_r) = a - b + bg'(x_r)$
vsaj kvadratnična konv. $a = 1$ in $b = m_\alpha$
$\lim_{x \to \alpha} G^{'} = 0, (a = 1,\, b = m_\alpha)$
Izrek o konvergenci : Naj bo f na intervalu $I = [a, \infty)$ dvakrat zvezno odvedljiva, naračajoča in konveksna funkcija, ki ima ničlo $\alpha \in I$. Potem je α edina ničla f na I in za vsak $x_o \in I$ tangetna metoda konvergira k α.

(1) **LU-brez-pivotiranja:**
$A = LU$, $Ax = b$, $LUx = b$, $Ly = b$, $Ux = y$
Big-O: $\frac{2n^3}{3} + \mathcal{O}(n^2)$

(2) **LU-delno-pivotiranje**:
$PLUx = Pb$, $\det(A) = det(U)$
$P = I \cdot \prod_{i=1}^{n-1} P_i$, $\prod_{i=1}^{n-1} L_i P_i \cdot A = U$