

Formelsammlung

- $\mathbb{N} = \mathbb{N} \setminus \{0\} = \{1, 2, 3, \dots\}$

$$\mathbb{N}_0 = \{0, 1, 2, \dots\}$$

- Exponentialfunktion:

$$a^b a^c = a^{b+c}$$

$$a^c b^c = (ab)^c$$

$$a^{b^c} = a^{(b^c)}$$

$$(a^b)^c = a^{bc}$$

$$a^{1/b} = \sqrt[b]{a}$$

$$a^b = e^{b \ln a}$$

- Logarithmus:

$$\log a + \log b = \log(a \cdot b)$$

$$\log a^b = b \cdot \log a$$

$$\log_a n = \log_a b \cdot \log_b n$$

$$\log 1 = 0$$

- \mathcal{O} -Notation: $g \in \mathcal{O}(f) \iff \exists C > 0 : \forall n \geq n_0 : g(n) \leq C \cdot f(n)$.

- Ω -Notation: $g \in \Omega(f) \iff f \in \mathcal{O}(g)$.

- Θ -Notation: $g \in \Theta(f) \iff f \in \mathcal{O}(g) \wedge g \in \mathcal{O}(f)$.

- Asymptotic growth: $\lim_{n \rightarrow \infty} \frac{f(n)}{g(n)} = \begin{cases} 0 : & f \in \mathcal{O}(g) \\ C : & f \in \Theta(g) \\ \infty : & f \in \Omega(g) \end{cases}$

- L'Hôpital: $\lim_{x \rightarrow \infty} \frac{f(x)}{g(x)} = \lim_{x \rightarrow \infty} \frac{f'(x)}{g'(x)}$, if $\lim_{x \rightarrow \infty} f(x) = \lim_{x \rightarrow \infty} g(x) = 0$ or $\pm\infty$.

- Master theorem: $T(n) \leq aT(n/2) + Cn^b : \begin{cases} T(n) \leq \mathcal{O}(n^b), & b > \log_2 a \\ T(n) \leq \mathcal{O}(n^b \log n), & b = \log_2 a \\ T(n) \leq \mathcal{O}(n^{\log_2 a}), & b < \log_2 a. \end{cases}$

If T is increasing, this holds $\forall n$ (else only for $n = 2^k$).

If above equation holds with "=", \mathcal{O} can be replaced with Θ .

Algorithmen

GROUP	ALGORITHM	RUNTIME
	Karatsuba	$\mathcal{O}(n^{\log_2(3)})$
Search	Binary Search	$\mathcal{O}(\log n)$
	Linear Search	$\mathcal{O}(n)$
Sort	IsSorted	$\mathcal{O}(n)$
	BubbleSort	$\mathcal{O}(n^2)$
	SelectionSort	$\mathcal{O}(n^2)$