

Big-Oh:

$$f(n) \in O(g(n)) \Leftrightarrow \exists_{c>0} \exists_{n_0>0} \forall_{n \geq n_0} : f(n) \leq c \cdot g(n)$$

Big-Omega:

$$f(n) \in \Omega(g(n)) \Leftrightarrow \exists_{c>0} \exists_{n_0>0} \forall_{n \geq n_0} : f(n) \geq c \cdot g(n)$$

Theta:

$$f(n) \in \Theta(g(n)) \Leftrightarrow f(n) \in O(g(n)) \wedge f(n) \in \Omega(g(n))$$

Sum rules:

$$\sum_{i=1}^n 1 = n$$

$$\sum_{i=1}^n i = \frac{n(n+1)}{2}$$

$$\sum_{i=1}^n i^2 = \frac{n(n+1)(2n+1)}{6}$$

$$\sum_{i=0}^n r^i = \frac{r^{n+1}-1}{r-1} \quad \text{if } r \neq 1$$

$$\sum_{i=0}^{\infty} r^i = \frac{1}{1-r} \quad \text{if } -1 < r < 1$$

$$\sum_{i=1}^n \frac{1}{i} \in \Theta(\log n)$$

Log rules:

$$\log_a(n) = x \Leftrightarrow n = a^x$$

$$\log_a(n) = \frac{\log_b(n)}{\log_b(a)}$$

$$\log_a(n * m) = \log_a(n) + \log_a(m)$$

$$\log_a(n/m) = \log_a(n) - \log_a(m)$$

$$\log_a n \in \Theta(\log_b n)$$