Some Equations

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July 15, 2013

1 Equations

The base e of the natural logarithm function for all x,

$$e^x = 1 + x + \frac{x^2}{2!} + \frac{x^3}{3!} + ... + \sum_{i=0}^{\infty} \frac{x^i}{i!} \tag{1}$$

When $x < 1$, we have the approximation:

$$1 + x \leq e^x \leq 1 + x + x^2 \tag{2}$$

The Master Method to determine the runtime for recursive algorithms:

if $T(n) \leq aT(\frac{n}{b}) + O(n^d)$, then

$$T(n) = \begin{cases} O(n^d \log n), & \text{if } a = b^d \text{ (Case 1)} \\ O(n^d), & \text{if } a < b^d \text{ (Case 2)} \\ O(n^{\log_b a}), & \text{if } a > b^d \text{ (Case 3)} \end{cases} \tag{3}$$