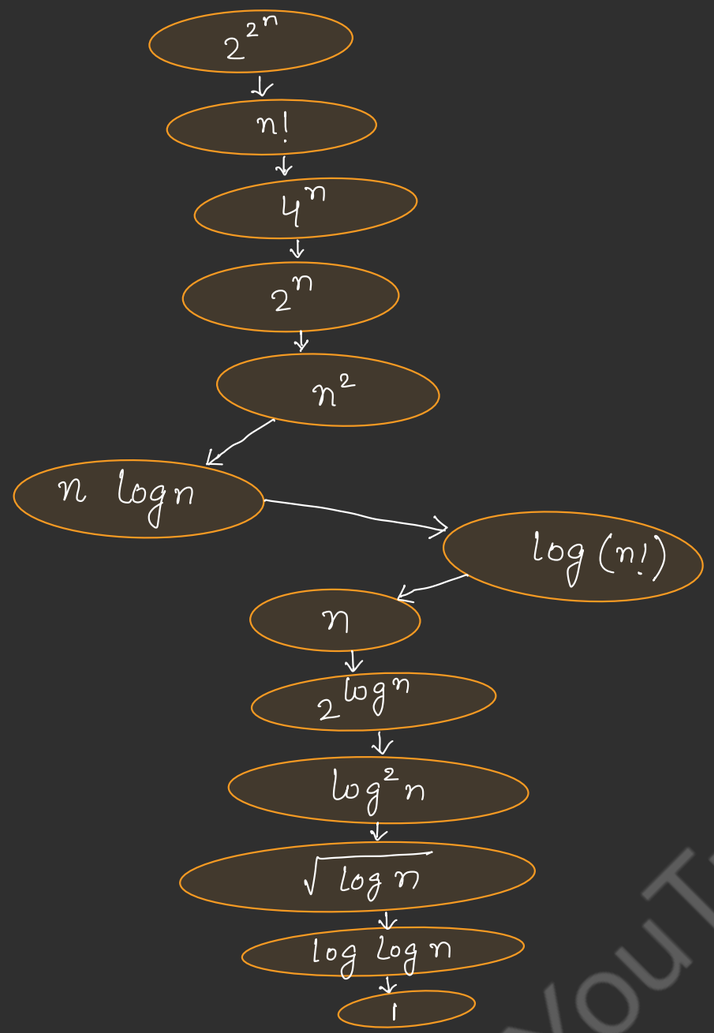
Topics to discuss

Compare the functions.

Commonly Used Rate of Growth :



Decreasing Rates of growth

$$1 < \log n < \sqrt{n} < n < n\log n < n^2 < n^3 < 2^n < 3^n < n^n$$

① Compare between, $f(n) = n^{\log n}$ and $g(n) = 2^{\sqrt{n}}$

Solution :-

$f(n) = n^{\log n}$

$\log n^{\log n}$

$\log n \log n$

$(\log n)^2$

$\log (\log n)^2$

$2 \log (\log n)$

$g(n) = 2^{\sqrt{n}}$

$\log 2^{\sqrt{n}}$

$\sqrt{n} \log 2$

$\sqrt{n}$

$\log \sqrt{n}$

$\log n^{\frac{1}{2}}$

$\frac{1}{2} \log n$

$\log n < n$

$f(n) < g(n)$

(2) $f(n) = 2^{\log n}$ and $g(n) = n^{\sqrt{n}}$

Solution :-

$f(n) = 2^{\log n}$

$\log 2^{\log n}$

$\log n \log_2 2$

$\log n$

$g(n) = n^{\sqrt{n}}$

$\log n^{\sqrt{n}}$

$\sqrt{n} \log_2 n$

$\sqrt{n} \log n$

$\log n$

$f(n) < g(n)$

③ $f(n) = 2n^2 + 4$ and $g(n) = 3n^2 + 8$

$f(n) = O(n^2)$ $\quad$ $g(n) = O(n^2)$

Asymptotically, $f(n)$ and $g(n)$ are same.

$f(n) = 2n^2 + 4$

$= 2n^2 + 4 - 2n^2$

$= 4$

$f(n) = O(1)$

$g(n) = 3n^2 + 8$

$= 3n^2 + 8 - 2n^2$

$= n^2 + 8$

$g(n) = O(n^2)$

$f(n) < g(n)$

Commonly Used Rate of Growth

Time Complexity	Name
1	Constant
$\log n$	Logarithmic
n	Linear
$n \log n$	Linear Logarithmic
n^2	Quadratic
n^3	Cubic
2^n	Exponential
$n!$	Factorial

Commonly Used Logarithms and Summations

$\rightarrow \log x^y = y \log x$

$\rightarrow \log xy = \log x + \log y$

$\rightarrow a^{\log_b x} = x^{\log_b a}$

$\rightarrow \log^k n = (\log n)^k$

$\rightarrow \log \frac{x}{y} = \log x - \log y$

$\rightarrow \log_b x = \frac{\log_a x}{\log_a b}$

Follow Now

Start Practicing

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