

Exercise 3.2-3:

\because By Stirling's Approximation, $n! = \sqrt{2\pi n} \left(\frac{n}{e}\right)^n (1 + \Theta(\frac{1}{n}))$

$\therefore \lg(n!) = \frac{1}{2} \lg(2\pi n) + n \lg n - n \lg e + \lg(1 + \Theta(\frac{1}{n}))$

$\because n \lg n$ is of the highest order

$\therefore \lg(n!) = \Theta(n \lg n)$

As for $n! = \omega(2^n)$, $n! = o(n^n)$ are self-evident.

Proof is omitted.