

Exercise 3-3:

$$\begin{aligned}1 &< \lg(\lg^* n) < \lg^*(\lg n) < \lg^* n < 2^{\lg^* n} < \ln \ln n < \sqrt{\lg n} \\&< \ln n < \lg^2 n < n^{\frac{1}{\lg n}} < 2^{\sqrt{2 \lg n}} < (\sqrt{2})^{\lg n} \\&< n = 2^{\lg n} < \lg(n!) < n \lg n < n^2 = 4^{\lg n} < n^3 < (\lg n)^{\lg n} \\&= n^{\lg \lg n} < \left(\frac{3}{2}\right)^n < 2^n < e^n < n \cdot 2^n < (\lg n)! < n! < (n+1)! \\&< 2^{2^n} < 2^{2^{n+1}}\end{aligned}$$