

Problem 1:

Using master theorem:

$$\begin{aligned}a &= 4 \\ b &= 4 \\ f(n) &= n \log n\end{aligned}$$

Then

$$\begin{aligned}\log_b^a &= 1 \\ f(n) &= \Omega(n^{\log_b^a - \epsilon})\end{aligned}$$

Therefore,

$$T(n) = \Theta(n \log n)$$