

2. Apply Master theorem to find asymptotic behaviour of $T(n)$

a) $T(n) = 25 \cdot T\left(\frac{n}{5}\right) + n$

$$k = \log_5 25 = \log_5 5^2 = 2$$

$$f(n) = n$$

$\Rightarrow n^2$ grows faster than $f(n)$.

$$\text{Thus, } T(n) = \Theta(n^2)$$

b) $T(n) = 2 \cdot T\left(\frac{n}{3}\right) + n \log(n)$

$$k = \log_3 2$$

$$f(n) = n \log(n)$$

$\Rightarrow f(n)$ grows faster than $n^{\log_3(2)}$

$$\text{Thus, } T(n) = f(n) = \Theta(n \log n)$$

c) $T(n) = T\left(\frac{3n}{4}\right) + 1$

$$k = \log_{\frac{3}{4}} 1 = 0$$

$$f(n) = 1 = n^0 \log^0 n$$

$$k = p$$

$$\text{Thus, } T(n) = \log n$$