

ICCS313: Assignment 2
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1: Part1

(a)

$$\begin{aligned} & 2T\left(\frac{n}{3}\right) + 1 \\ & a = 2, b = 3, d = 0 \\ & \log_b a = \log_3 9 \\ & \log_3 9 > 0 \\ & = O(n^{\log_3 2}) \end{aligned}$$

(b)

$$\begin{aligned} & 5T\left(\frac{n}{4}\right) + n \\ & a = 5, b = 4, d = 1 \\ & \log_b a = \log_4 5 \\ & \log_4 5 > 1 \\ & = O(n^{\log_4 5}) \end{aligned}$$

(c)

$$\begin{aligned} & 7T\left(\frac{n}{7}\right) + n \\ & a = 7, b = 7, d = 1 \\ & \log_b a = \log_7 7 \\ & 1 = 1 \\ & = O(n \log n) \end{aligned}$$

(d)

$$\begin{aligned} & 9T\left(\frac{n}{3}\right) + n^2 \\ & a = 9, b = 3, d = 2 \\ & \log_b a = \log_3 9 \\ & 2 = 2 \\ & = O(n^2 \log n) \end{aligned}$$

(e)

$$\begin{aligned} & 8T\left(\frac{n}{2}\right) + n^3 \\ & a = 8, b = 2, d = 3 \\ & \log_b a = \log_2 8 \\ & 3 = 3 \\ & = O(n^3 \log n) \end{aligned}$$

(f)

$$\begin{aligned} & T(n-1) + 2 \\ & (T(n-2) + 2) + 2 \\ & (T(n-3) + 2) + 2 + 2 \\ & (T(n-4) + 2) + 2 + 2 + 2 \\ & \cdot \\ & \cdot \\ & \cdot \end{aligned}$$

$$\begin{aligned} & (T(0) + 2) + 2(n - 1) \\ & T(n-1) \text{ run } n \text{ times so it is } 2n \\ & = O(n) \end{aligned}$$

$$\begin{aligned} & \textbf{(g)} \\ & T(n - 1) + 2^c \\ & (T(n - 2) + 2^c) + 2^c \\ & (T(n - 3) + 2^c) + 2^c + 2^c \\ & (T(n - 4) + 2^c) + 2^c + 2^c + 2^c \\ & \cdot \\ & \cdot \\ & \cdot \\ & (T(0) + 2^c) + 2^c \cdot (n - 1) \\ & = O(n \cdot 2^c) \\ & = O(n) \end{aligned}$$

2: Part2
