Eg) $T(n) = \begin{cases} 4T\left(\frac{n}{2}\right) + 1 & , n > 1 \\ 1 & , n = 1 \end{cases}$

$$\boxed{T(n) = 4T\left(\frac{n}{2}\right) + 1} \text{ --- } (1) \quad \to 1 = 4^0$$

Get $T\left(\frac{n}{2}\right)$: $T\left(\frac{n}{2}\right) = 4T\left(\frac{n}{4}\right) + 1$

Sub in (1): $$\boxed{T(n) = 16\,T\left(\frac{n}{4}\right) + 5} \text{ --- } (2) \quad \to 5 = 4^0 + 4^1$$

Get $T\left(\frac{n}{4}\right)$: $T\left(\frac{n}{4}\right) = 4T\left(\frac{n}{8}\right) + 1$

Sub in (2): $$\boxed{T(n) = 64\,T\left(\frac{n}{8}\right) + 21} \text{ --- } (3) \quad \to 21 = 4^0 + 4^1 + 4^2$$

k^{th} step: $$T(n) = 4^k\,T\left(\frac{n}{2^k}\right) + \{\underbrace{4^0 + 4^1 + \cdots + 4^k}\}$$

Geometric series sum as done in previous egs.

$$\boxed{T(n) = 4^k\,T\left(\frac{n}{2^k}\right) + \frac{4^k}{3} - \frac{1}{3}} \text{ --- } (4)$$

Base cond: $T(1) = 1 \quad \therefore k = \log n$

Sub in (4): $$T(n) = 4^{\log n}\,T(1) + \frac{4^{\log n}}{3} - \frac{1}{3}$$

$$= n^2 + \frac{n^2}{3} - \frac{1}{3} = \frac{4}{3}n^2 - \frac{1}{3}$$

$$\therefore \boxed{O(n^2)}$$