

PART 1

a) $T(n) = 3T(n/2) + n$

Solution: $\Theta(n^{\log_a b})$

$a = 3$

$b = 2$

$f(n) = \Theta(n) \Rightarrow d = 1$

$b^d = 2 \Rightarrow a > b^d$ So, Case 3

Thus,

$$T(n) = \Theta(n^{\log_a b})$$

b) $T(n) = 64T(n/8) - n^2(\log n)$

Solution: **NA**

$f(n) = n^2(\log n)$

Here $f(n)$ is not in the form of $\Theta(n^d)$. So we cannot apply Master Theorem.

c) $T(n) = 2nT(n/2) + n^n$

Solution: **NA**

$f(n) = n^n$ is not in the form of $\Theta(n^d)$. So we cannot apply Master Theorem.

d) $T(n) = 3T(n/3) + n/2$

Solution: $\Theta(n^3 \log n)$

$a = 3$

$b = 3$

$f(n) = \Theta(n) \Rightarrow d = 1$

$b^d = 3 = a \Rightarrow a = b^d$ So, Case 2

Thus,

$$T(n) = \Theta(n^d \log n) = \Theta(n^3 \log n)$$

e) $T(n) = 7T(n/3) + n^2$

Solution: $\Theta(n^2)$

$a = 7$

$b = 3$

$f(n) = \Theta(n^2) \Rightarrow d = 2$

$b^d = 3^2 = 9 > a \Rightarrow a < b^d$ So, Case 1

Thus,

$$T(n) = \Theta(n^d) = \Theta(n^2)$$