6 $T(n) = 2T\left(\frac{n}{2}\right) + \Theta(n \log(n)) \qquad T(1) = \Theta(1)$

metodo iterativo

$$T(n) = 2\left[2T\left(\frac{n}{2^2}\right) + \Theta\left(\frac{n}{2}\log\left(\frac{n}{2}\right)\right)\right] + \Theta(n\log(n))$$

$$T(n) = 2^K T\left(\frac{n}{2^K}\right) + \sum_{i=0}^{K-1} 2^i \Theta\left(\frac{n}{2^i}\log\left(\frac{n}{2^i}\right)\right) \qquad K = \log(n)$$

$$T(n) = \Theta\left(2^{\log(n)}\right) + \Theta(n) \sum_{i=0}^{\log(n)-1} \log\left(\frac{n}{2^i}\right)$$

$$T(n) = \Theta\left(2^{\log(n)}\right) + \Theta(n) \sum \log(n) - n\sum \log(2^i)$$

$$T(n) = \Theta\left(2^{\log(n)}\right) + \Theta(n\log^2(n) - n\sum i)$$

$$T(n) = \Theta(n) + \Theta\left(n\log^2(n) - n\frac{\log^2(n) + \log(n)}{2}\right) = \Theta(n\log^2(n))$$

metodo di sostituzione

$T(n) = 2T\left(\frac{n}{2}\right) + cn \qquad T(1) = d$

IPOTESI $\quad T(n) = O(n \log^2 n) \qquad T(n) \leq Kn \log^2(n) - hn$

C.B. $\quad T(2) = d \qquad 2d + cn \leq 2K \qquad K \geq d + \frac{cn}{2}$

IP. IND. $\quad \forall m < n, \; T(m) = O(m \log^2(m))$

$$2\left[\frac{n}{2}\log^2\left(\frac{n}{2}\right)\right] + c \leq n \log^2(n) - hn$$

$$n \log^2(n) + c \leq n \log^2(n) + hn$$

$$c \leq hn$$