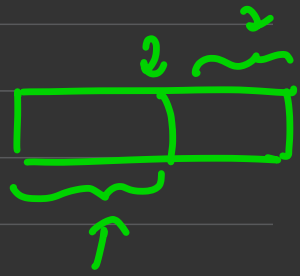
Ternary Search

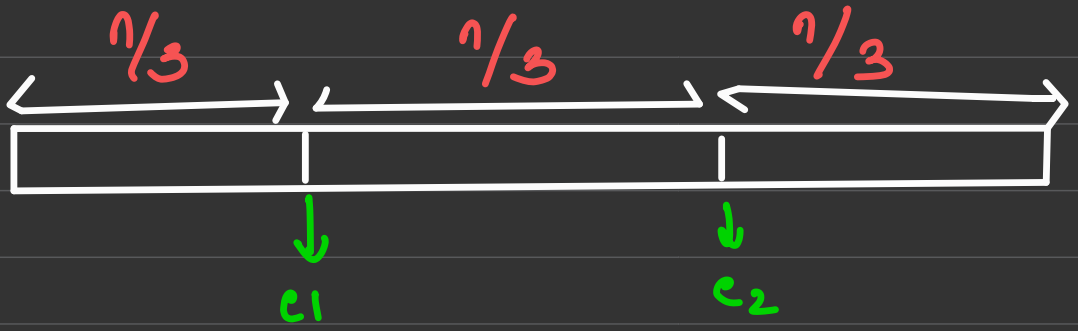
Linear → $T(n) = T(n-1) + O(1)$

Binary search →

$$T(n) = T\left(\frac{n}{2}\right) + 1 \times c =$$



forget

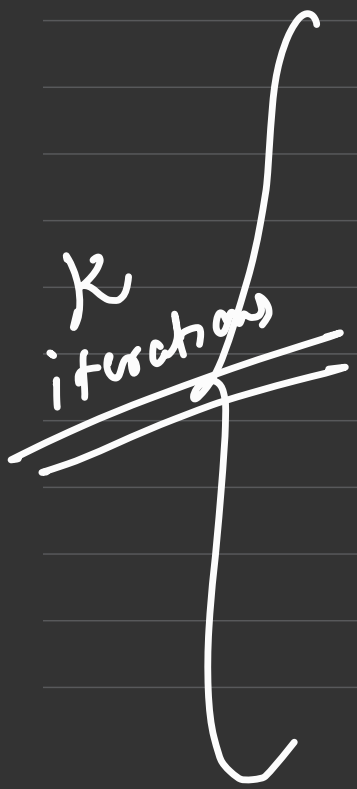


$$T(n) = T\left(\frac{n}{3}\right) + 2 \times c$$

← recurrence of T.S

Binary Search

more iteration



$n \to \frac{n}{2} \to \frac{n}{4} \to \cdots \to \frac{n}{2^k}$

$\frac{n}{2^k} = 1$

$K = \log_2 n$

$O(\log n)$

Ternary Search

$n \to \frac{n}{3} \to \frac{n}{9} \to \cdots \to \frac{n}{3^{k'}}$

$\frac{n}{3^{k'}} = 1$

$K = \log_3 n$

$O(\log n)$

$T(n) = T\left(\frac{n}{2}\right) + 1 \times C$

$T(n/2) = T(n/4) + 1 \times C$

$T(n/4) = T(n/8) + 1 \times C$

$\vdots \quad \vdots \quad \vdots$

$T(2) = T(1) + 1 \times C$

K

$T(n) = T(1) + K \times C$

$K = \log_2 n$

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

$T(n/3) = T(n/9) + 2C$

$T(n/9) = T(n/27) + 2C$

$\vdots \quad \vdots \quad \vdots$

$T(3) = T(1) + 2C$

K'

$T(n) = T(1) + K' \times 2 \times C$

actual no of comparison in worst case

$\log_2 n$ $\longleftrightarrow$ $\log_3 n \times 2x$

$\log_2 n$ $\longleftrightarrow$ $\frac{2 \times \log_2 n}{\log_2 3}$

actual no of comparisons are greater in ternary search.

Race time

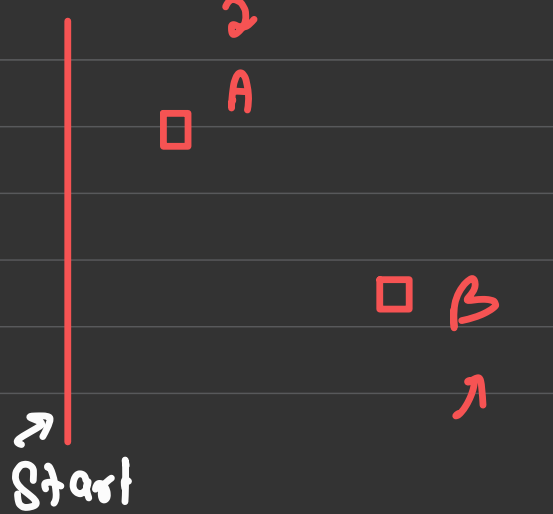
$$f(T) = \max(p_i(T)) - \min(p_j(T))$$

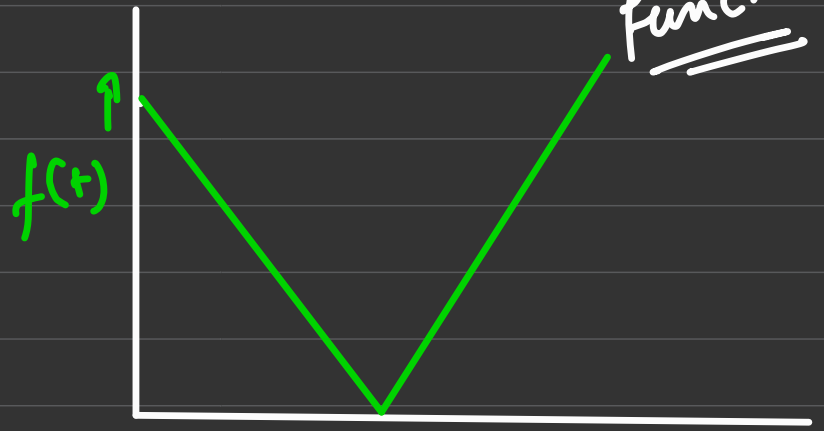
$$P_i(T) = S_i \times T + D_i$$

$f(T)$

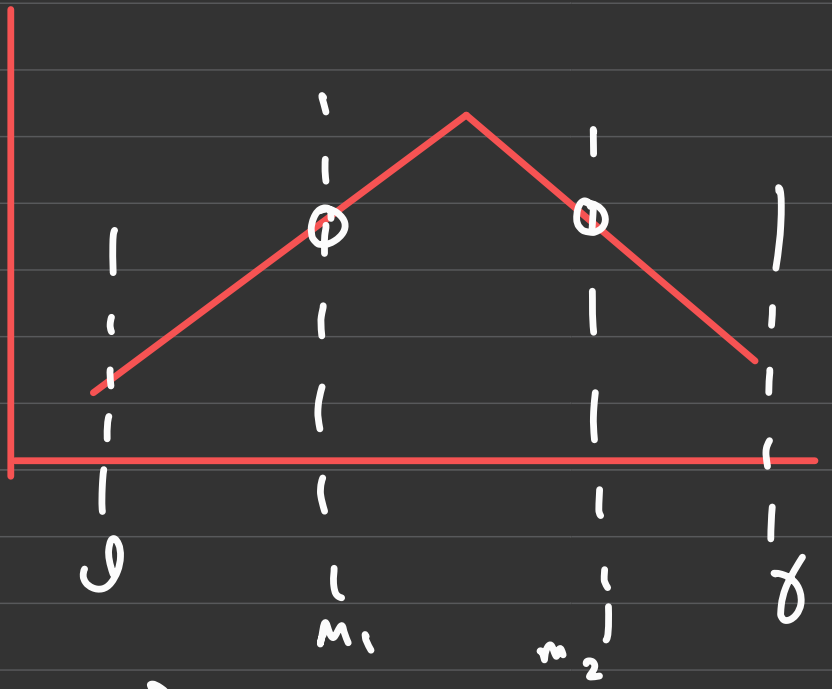
$Speed_A > Speed_B$

$D_A < D_B$



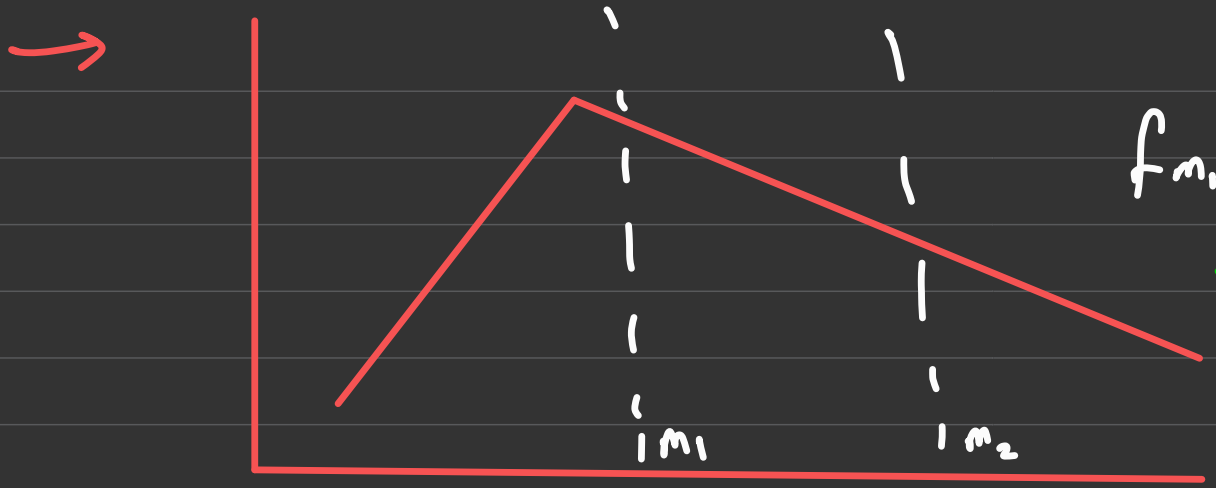


Q3



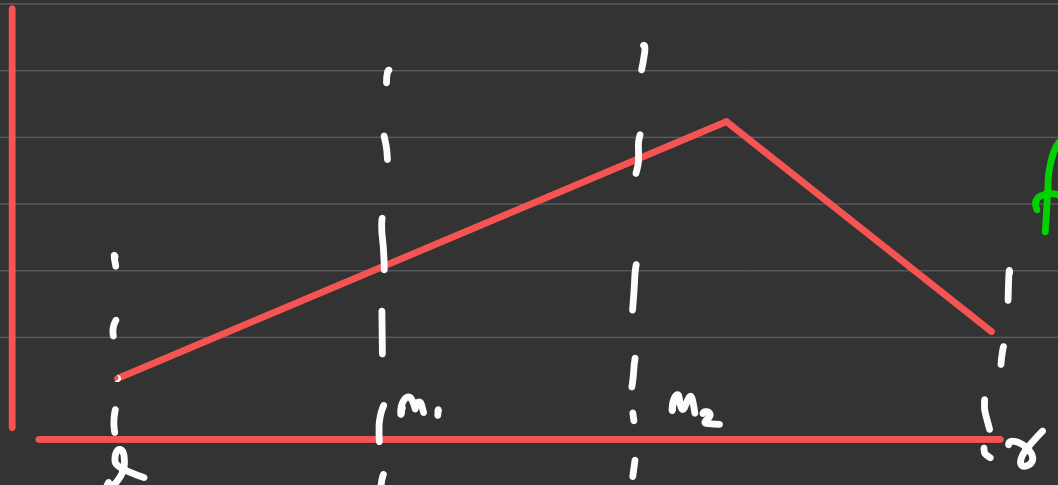
$f(m_1) = f(m_2)$

$[\alpha, \beta] \Rightarrow [m_1, m_2]$



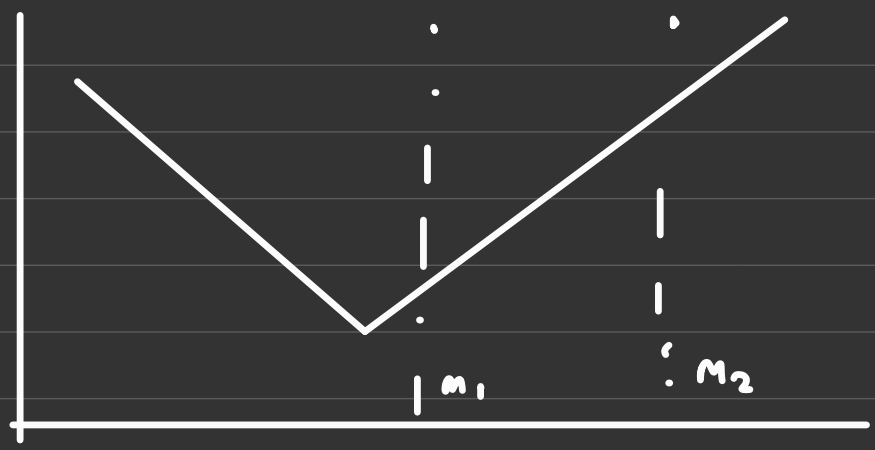
$f_{m_1} > f_{m_2}$

$\rightarrow [l, m_2]$



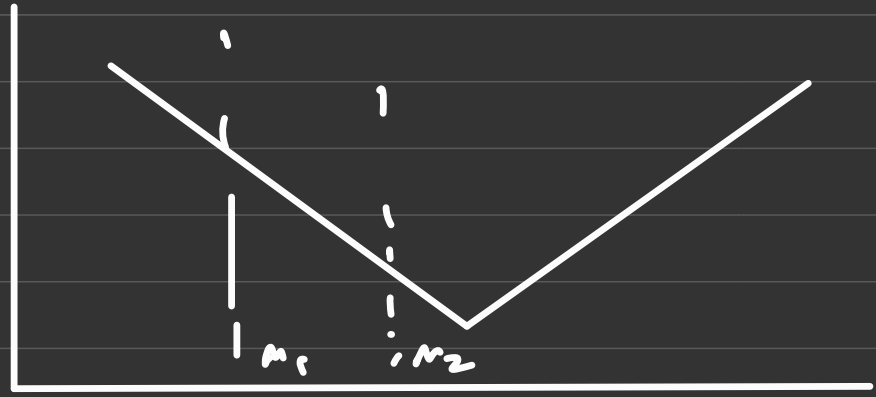
$f_{m_1} < f_{m_2}$

$[l, 0] \rightarrow [m_1, \infty]$



$f_{m_1} < f_{m_2}$

↳ $[10, m_2]$



$f_{m_1} > f_{m_2} \longrightarrow [m_1, \infty]$