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

$: n = 3^K \downarrow$

$$T(3^K) = 2T(3^{K-1}) - T(3^{K-2}) + 3^K$$

$$T(3^K) = T_K$$

$$T_K = 2T_{K-1} - T_{K-2} + 3^K \longleftarrow T_K = T_K^{(h)} + T_K^{(p)}$$

$$r^2 - 2r + 1 \qquad \frac{4 \pm \sqrt{4-4}}{2} \left\langle \begin{matrix} \frac{4}{2} \\ \frac{4}{2} \end{matrix} \right\rangle 2$$

$$T_K^{(h)} = A2^K + Bk2^K \qquad T_K^{(p)} = C3^K$$

$$C3^K = \frac{2C3^K}{3} - \frac{C3^K}{9} + 3^K$$

$$C = \frac{2}{3}C - \frac{1}{9}C + 1 \qquad C = 9/4$$

$$\frac{4}{9}C = 1$$

$$T_K = A2^K + Bk2^K + \frac{9}{4}3^K \qquad n = 3^K$$

$$K = \log_3(n)$$

- $T(n) = A2^{\log_3(n)} + B\log_3(n)2^{\log_3(n)} + \frac{9}{4}n$
- $T(n) = An^{\log_3(2)} + B\log_3(n) \times n^{\log_3(2)} + \frac{9}{4}n$

$$O(\log_3(n)n^{0.64}) \text{ vs } O(n^1)$$

$$c\log_3(n) \times n^{0.64} \geq n$$

$n = 5$

$41.03 \geq 5 \qquad c = 10 \qquad \forall n \geq K \qquad n = 10$

$91.48 \geq 10 \qquad 10 \times \log_3(n) \times n^{0.64} \geq n \qquad n = 100$

$n = 1000$

$798.73 \geq 100$