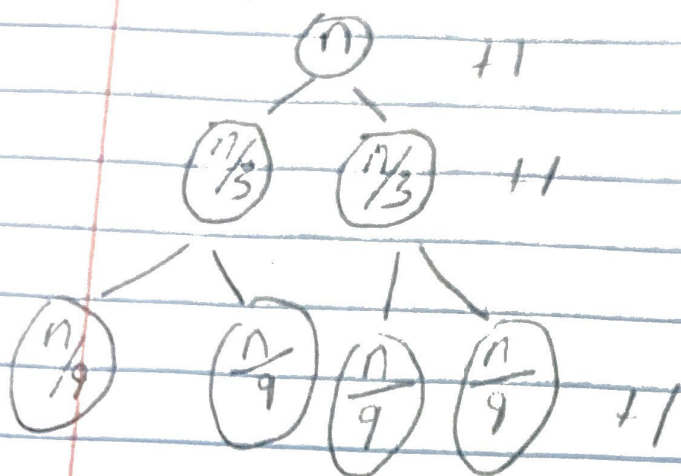


# Assignment 2

①  $w(n) = 2w(n/3) + 1$

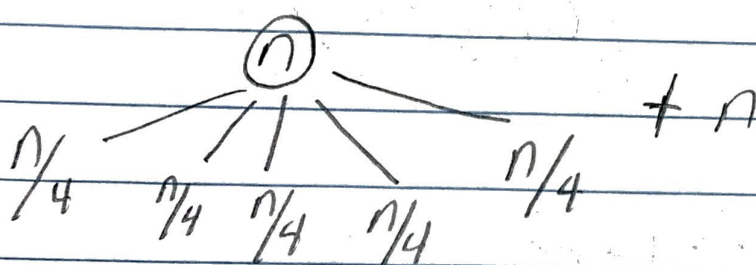


$\frac{n}{3^i} = 1$  end of tree

$i = \log_3 n$

$n^{\log_3 2}$   
 $O(n^{\log_3 2})$

②  $w(n) = 5w(n/4) + n$



$5 \times n/16$   $\frac{n}{4^i} = 1$   $i = \log_4 n$

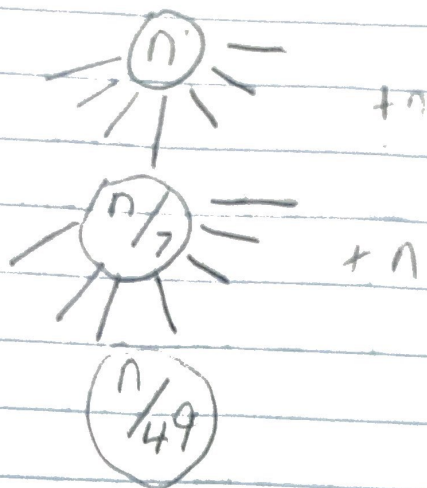
$w(n) = \sum_{i=0}^{\log_4 n} 5^i$

$1 + 5 + 25 + 125 \dots$

$n^{\log_4 5} \cdot n$

$O(n^{\log_4 5} \cdot n)$

$$(3) \quad W(n) = 7W(n/7) + n$$



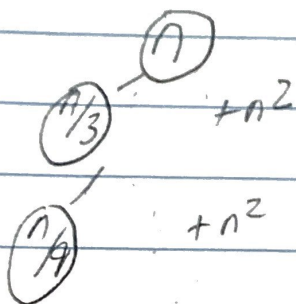
$$\frac{n}{n/7} = 7$$

$$i = \log_7 n$$

$$n \cdot i = n^2$$

$$O(n^2)$$

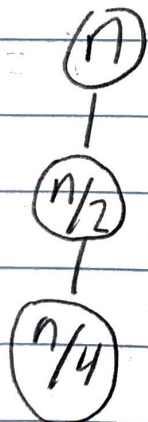
$$(4) \quad W(n) = 9W(n/3) + n^2$$



$$\frac{n}{n/3} = 3, \quad i = \log_3 n \cdot n^2$$

$$O(\log_3 n \cdot n^2)$$

$$(5) \quad W(n) = 8W(n/2) + n^3$$



$$+ n^3$$

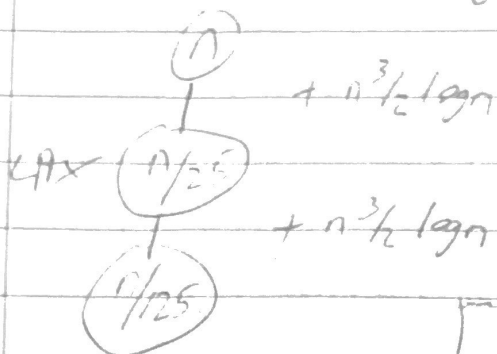
$$\frac{n}{n/2} = 2$$

$$+ n^3$$

$$i = \log_2 n$$

$$O(\log_2 n \cdot n^3)$$

$$6) \quad w(n) = 49w(n/25) + n^{3/2} \log n$$

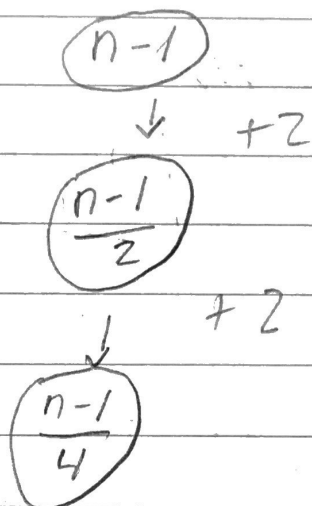


$$\frac{n}{25^i} = 1$$

$$i = \log_{25} n$$

$$O(n^{\log_{25} 49} + n^{3/2} \log n)$$

$$7) \quad w(n) = w(n-1) + 2$$



$$\frac{n-1}{n^i} = 1$$

$$i = \log n(n-1)$$

$$i = \log(n)$$

$$O(n)$$

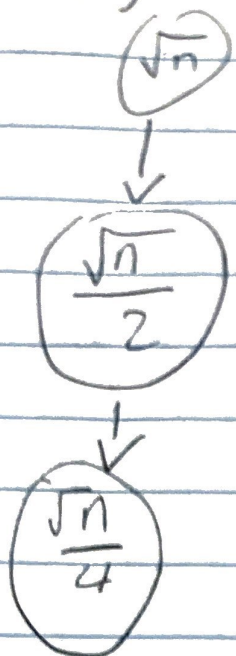
$$8) \quad w(n) = w(n-1) + nc, \text{ with } c \geq 1$$

Constant

$$\frac{n-1}{n^i} + n^c \quad O(n^2)$$



(1)  $w(n) = w(\sqrt{n}) + 1$



$$\frac{\sqrt{n}}{n} = 1$$

$$O(\log(\sqrt{n}))$$

(2) Algo A  $w(n) = 5w(n/2) + n$



$$\frac{n}{2} = 1 \quad n \log n = O(n^2)$$

Lowest work

Algo B  $w(n) = 2w(n-1) + 1$

$$2^i + 1 = O(2^n)$$

Algo C  $w(n) = 9w(n/3) + n^2$

$$n \downarrow + n^2$$

$$n/3 \downarrow + n^2$$

$$n/9$$

$$\frac{n}{3^i} \quad i = \log n$$

$$O(\log n \cdot n^2)$$