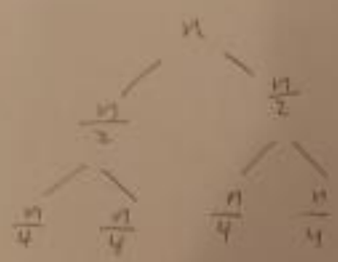
$w(n) = a \cdot W(n/b) + f(n)$

let $a = 2$, $b = 2$



level	n	total cost
		$c_1 n + c_2$
0	n	
1	$n/2$	$2(c_1 n/2 + c_2)$
2	$n/4$	$4(c_1 n/4 + c_2)$
i	$n/2^i$	$c_b \cdot n$

$$\sum_{i=0}^{\log n} (c_1 n + 2^i c_2)$$ let $c_1 = 1$

$$= \sum_{i=0}^{\log n} (n + 2^i c_2)$$

$$= n \sum_{i=0}^{\log n} 1 + \sum_{i=0}^{\log n} 2^i c_2$$

$$< c_1 n \log n + 2 c_2 n$$

$$\in O(n \log n)$$

$w(n) = a \cdot w(n/b) + f(n^2)$

let $a = 2$, $b = 2$

n^2

$\left(\frac{n}{2}\right)^2 \quad \left(\frac{n}{2}\right)^2$

$\left(\frac{n}{4}\right)^2 \quad \left(\frac{n}{4}\right)^2 \quad \left(\frac{n}{4}\right)^2 \quad \left(\frac{n}{4}\right)^2$

level	n	total cost
0	n^2	$c_1 n^2 + c_2$
1	$\frac{n}{2}$	$c_1 \frac{n^2}{2} + 2c_2$
		$c_1 \frac{n^2}{4} + 4c_2$
2	$\frac{n}{4}$	
⋮		
i	$\frac{n}{2^i}$	$c_1 \frac{n^2}{2^i} + 2^i \cdot c_2$

$$= \sum_{i=0}^{\log n} \left(c_1 \frac{n^2}{2^i} + 2^i c_2 \right)$$

$$= n^2 \sum_{i=0}^{\log n} \frac{1}{2^i} + c_2 \sum_{i=0}^{\log n} 2^i \qquad \text{let } c_1 = 1$$

$$< 2c_1 n^2 + 2c_2 n$$

$$\in \boxed{O(n^2)}$$

$b=2 \quad a=4$

$4T(\frac{n}{2}) + n^3$

level	n	total cost
0	n	n^3
1	$\frac{n}{2}$	$c_1 \frac{n^3}{2} + 4c_2$
2	$\frac{n}{4}$	$c_1 \frac{n^3}{4} + 16c_2$
⋮		⋮
i	$\frac{n}{2^i}$	$c_1 \frac{n^3}{2^i} + 4^i c_2$

$$= \sum_{i=0}^{\log n} \left(c_1 \frac{n^3}{2^i} + 4^i c_2 \right)$$

$$= c_1 n^3 \sum_{i=0}^{\log n} 2^i + c_2 \sum_{i=0}^{\log n} 4^i \qquad \text{let } c_1 = 1$$

$$= n^3 \sum_{i=0}^{\log n} 2^i + c_2 \sum_{i=0}^{\log n} 4^i$$

$$< 2n^3 + 4c_2 n$$

$$\in O(n^3)$$