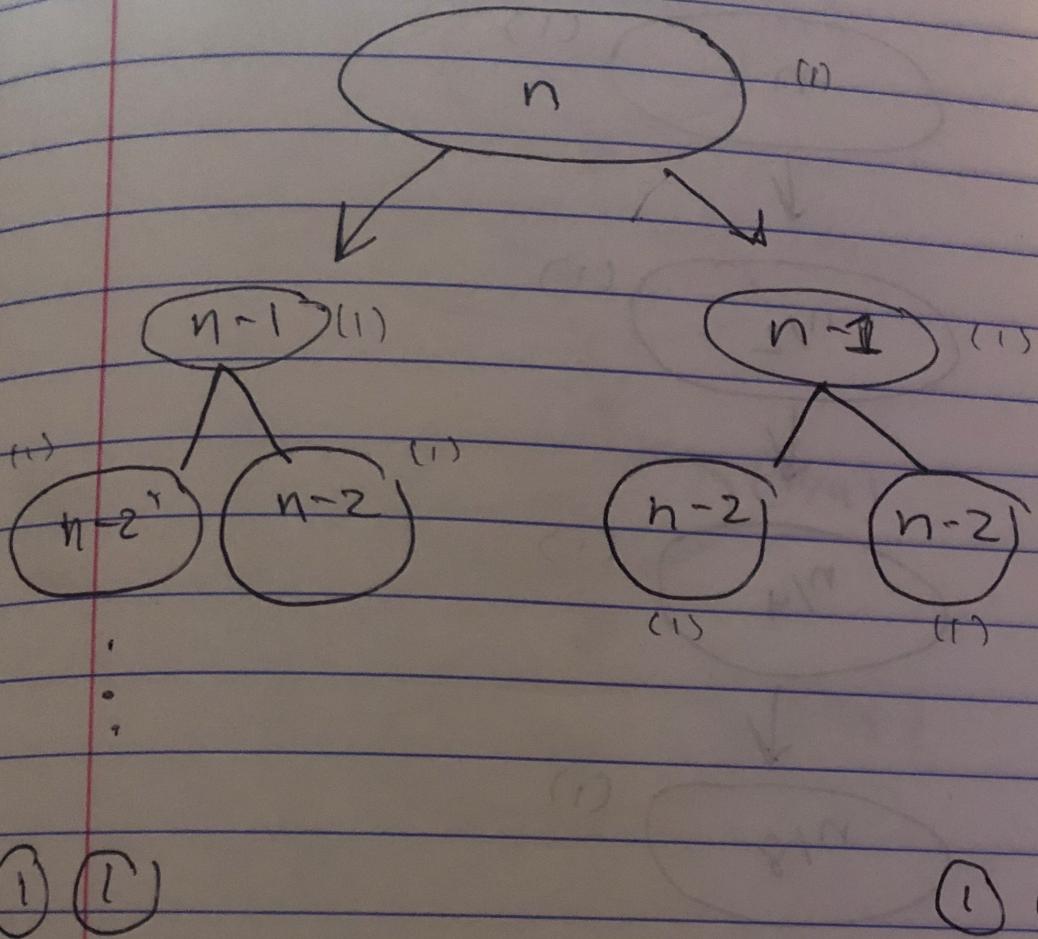
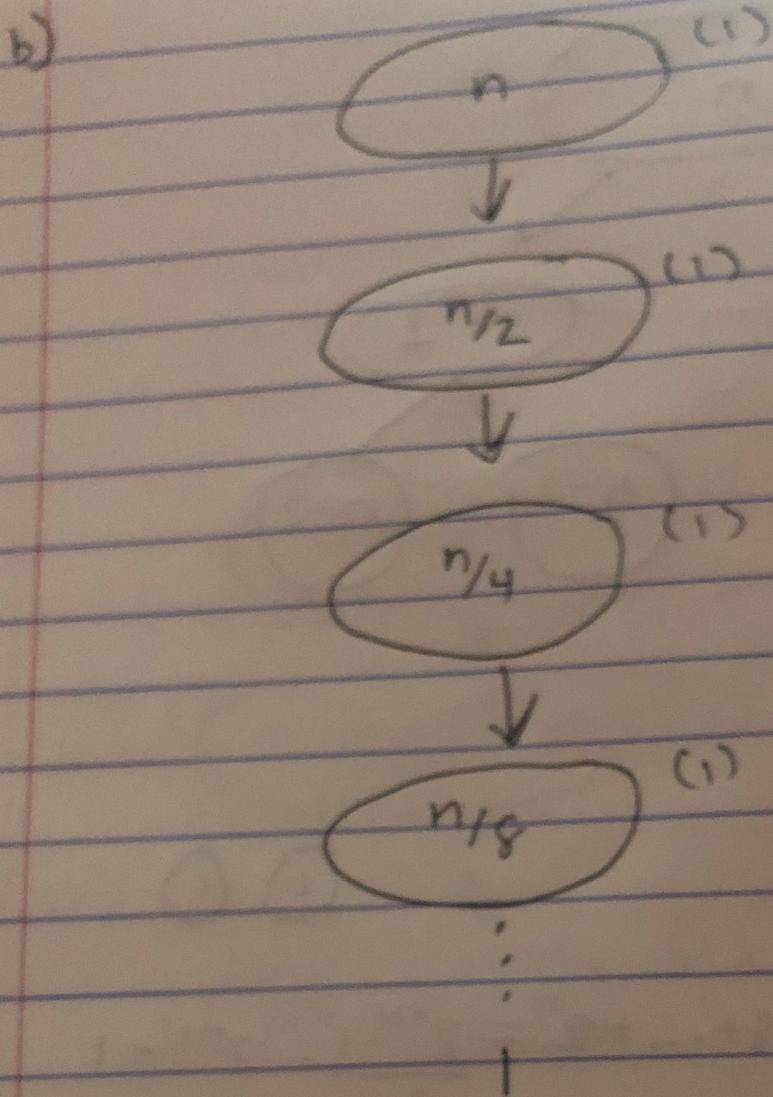


Question 2



$$T(n) = 1 + 2 + 4 + 8 + \dots + 2^n = \frac{2^{n+1} - 1}{2 - 1} = 2^{n+1} - 1$$

$$= 2^n \cdot 2 - 1 \\ \Theta(2^n)$$



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

$$n = 2^k$$

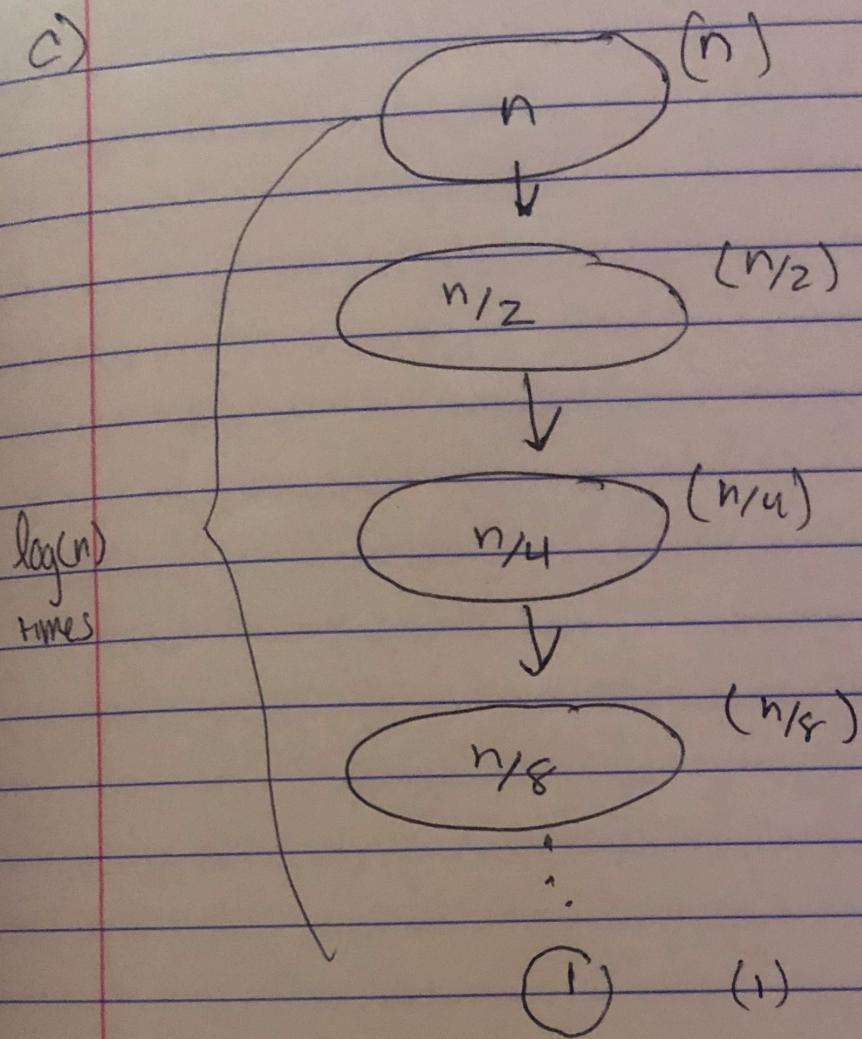
$$K = \log_2(n)$$

$$\log(n) = K \log(2)$$

$$T(n) = \underbrace{1 + 1 + 1 + \dots + 1}_{\log(n)} = \log(n)$$

$\Theta(\log(n))$

c)



$$T(n) = n + n/2 + n/4 + n/8 + \dots + 1$$

$$= n \left(1 + \frac{1}{2} + \frac{1}{4} + \frac{1}{8} + \dots + \frac{1}{n} \right)$$

$$= n \left(\frac{\frac{1}{2}^n - 1}{\frac{1}{2} - 1} \right)$$

$$= n \left(\frac{\frac{1}{2} \cdot \frac{1}{2}^{n-1} - 1}{-\frac{1}{2}} \right)$$

$$= n \left(-\frac{1}{2}^n + 2 \right) = -\frac{n}{2^n} + 2n = \Theta(n)$$