

I'm sorry, but I probably did this completely wrong.

### Problem 3: Runtime Analysis

$$(a) \sum_{i=2}^{n-1} \Theta(1) + \Theta(1)$$

$$\sum_{i=2}^{n-1} \Theta(1) + \sum_{i=2}^{n-1} \Theta(1)$$

$$\Theta(n) + \Theta(n) = \Theta(n)$$

$$(b) \sum_{i=1}^n \left( \Theta \left( \sum_{k=0}^{i^3} \Theta(1) \right) \right)$$

$$= \sum_{i=1}^n \sum_{k=0}^{i^3} \Theta(1)$$

$$= \sum_{i=1}^n \Theta(n^3)$$

$$= \Theta(n^4)$$

$$\sum_{i=1}^n \Theta(i^p) = \Theta(n^{p+1})$$

$$(c) \sum_{i=1}^n \sum_{k=1}^n O(\sum_{m=1}^n O(1))$$

$$= \sum_{i=1}^n \sum_{k=1}^n O(\theta(n))$$

$$= \sum_{i=1}^n \theta(n^2)$$

$$= \theta(n^3)$$

$$\sum_{i=1}^n \theta(i^p) = \theta(n^{p+1})$$

$$\sum_{i=1}^n \theta(i^p) = \theta(n^{p+1})$$

$$(d) \sum_{i=0}^{n-1} (O(\theta(1) + \theta(1)) + \sum_{j=0}^{i-1} (\theta(1) + \theta(1) + \theta(1) + \theta(1)) + \theta(1))$$

$\leftarrow i = \text{size I think}$

$$\sum_{i=0}^{n-1} ((O(\theta(1) + \sum_{j=0}^{i-1} (\theta(1)))) + \theta(1))$$

$$\sum_{i=0}^{n-1} (\theta(1) + (\theta(1) + \sum_{j=0}^{i-1} \theta(1)))$$

$$\sum_{i=0}^{n-1} \theta(1) + \sum_{i=0}^{n-1} (\theta(1) + \sum_{j=0}^{i-1} \theta(1))$$

$$\theta(n) + \theta(n) + \sum_{i=0}^{n-1} \sum_{j=0}^{i-1} \theta(1)$$

$$\theta(n) + \sum_{i=0}^{n-1} \theta(n)$$

$$\sum_{i=1}^n \theta(i^p) = \theta(n^{p+1})$$

$$\theta(n) + \theta(n^2) = \boxed{\theta(n^2)} \text{ I think.}$$