

3) a)  $n = 4, 7, 20, 50, 280$  while  $(i \leq n)$   
 $i = 2$   
 $i = i^2$   
 since it is  $i^2$  but  $i = 2$   
 it's  $\log(\log(n)) + 1$

n =	4	7	20	300
iter	1	2	3	4

$$T(n) = O(1) + O(\log(\log(n)) + 1)$$

$$\underline{T(n) = O(\log(\log(n)))}$$

b) 2 cases: satisfies if statement, or does not.

If it does not,  $T(n) = \sum_1^n O(1) = O(n)$

In case 2: for loop runs  $i^3$  times + if statement occurs  $\sqrt{n}$  times.

$$T(n) = \sum_{i=1}^{\sqrt{n}} \sum_{k=0}^{i^3} O(1) \rightarrow \sum_{i=1}^{\sqrt{n}} i^3 = n^{3/2} \cdot n^{1/2} = n^2$$

c) Case 1: Not satisfying if statement

$$\sum_{i=1}^n \left( O(1) \sum_{k=1}^n O(1) \right) = T(n) = O(n^2)$$

$$b) T(n) = \sum_{i=1}^{\sqrt{n}} \sum_{k=0}^{i^3} O(1) + O(n)$$

$\underbrace{\hspace{10em}}_{O(n^{3/2})} + O(n)$

Case 2) satisfies if statement

if statements run  $O(n)$

for loops  $n \begin{bmatrix} 1 & 2 & 4 & 9 \\ 1 & 2 & 3 & 4 \end{bmatrix} O(\log(n)) \therefore \sum_{i=1}^n \sum_{j=1}^{\log(n)} O(1)$

$$T(n) = O(n \log n)$$

$$T(n) = O(n^2) + O(n \log n)$$

$$\uparrow T(n) = O(n^2)$$

d) \* Get assistance \*

$$\sum_{i=0}^{n-1} (\Theta(1) + \Theta(\sum_{u=0}^{size-1} \Theta(1)))$$

$$= \Theta(n) + \sum_{u=0}^{size-1} \Theta(1) \quad \text{*constant runtime}$$

$$n \leq 10$$

$$Size \approx 10$$

$$T(n) \Theta(n) = 10$$

$$\Theta(n) = 10(3/2)^2 \quad \text{or} \quad 10(3/2)^k \quad \sum_{i=0}^k \sum_{j=0}^{size-1} = \sum_{i=0}^{\log_{3/2} n} \sum_{j=0}^{size-1}$$

by geometric series:

$$10 \sum_{j=0}^k (3/2)^j = \Theta(3/2)^k$$

$$= \Theta(3/2)^{\log_{3/2} (n/10)}$$

$$= \Theta\left(\frac{n}{10}\right) = \Theta(n)$$



4)  $in1 = 1$   $in2 = 5$   $\therefore$  4 loops then null

$in1 \rightarrow next = llrec(in2, in \rightarrow next)$

$llrec(\{5\}, \{2\}) = \{5\} \rightarrow next = llrec(2, 6)$

$(2, 6) \rightarrow next = llrec(6, 3)$

$\{6\} \rightarrow next = llrec(3, NULL)$

$6 \rightarrow 3 \rightarrow 4 \rightarrow NULL$

$\{6, 3, 4\}$

$\hookrightarrow \{2, 6, 3, 4\}$

$\hookrightarrow \{5, 2, 6, 3, 4\}$

b)  $in1 = NULL$ ,  $in2 = 2$

$llrec(in1, in2)$

$llrec(NULL, \{2\})$

$\hookrightarrow \{2\}$

$in \neq 2$

only  $\{2\}$  is returned

$\hookrightarrow \{1, 5, 2, 6, 3, 4\}$

$llrec(1, 2, 3, 4, 5, 6)$