

Hw 1

Part A

$$O(1)$$

$$2^{\log_2 n}$$

$$\log_2(\log_2 n)$$

$$O(\log_2 \log_2 n)$$

$$i=2$$

$$i=4$$

$$i=16$$

$$i=256$$

$$i=2^{2^n}$$

Part B

$$\sum_{i=0}^{\sqrt{n}} \sum_{j=0}^{\sqrt{n}} O(1)$$

$$i \% \sqrt{n} == 0$$

$n=9$

$i=1 \times$	$i=6 \checkmark$
$i=2 \times$	$i=7 \times$
$i=3 \checkmark$	$i=8 \times$
$i=4 \times$	$i=9 \checkmark$
$i=5 \times$	

$$n=4$$

$i=1$	$1 \% \sqrt{4} \neq 0$
$i=2$	$2 \% \sqrt{4} = 0 \checkmark$
$i=3$	$3 \% \sqrt{4} \neq 0$
$i=4$	$4 \% \sqrt{4} = 0 \checkmark$

if statement runs
 \sqrt{n} # of times

inner loop runs till $2^3=8$

$i=4$ inner loop runs till $4^3=64$

$$\sum_{i=0}^{\sqrt{n}} \sum_{j=0}^{\sqrt{n}} O(1) \rightarrow \sum_{i=0}^{\sqrt{n}} O(i^3)$$

$$\sum_{i=0}^{\sqrt{n}} O(i^3 \sqrt{n})$$

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

inner loop only
 runs on multiples
 of \sqrt{n} so
 $i = j\sqrt{n}$

$$n^{1/2} \sum_{i=0}^{\sqrt{n}} i^3 = \left(\frac{\sqrt{n}(\sqrt{n}+1)}{2} \right)^2 = O(\sqrt{n}^4)$$

$$O(n^{3/2} \cdot n^2)$$

$$O(n^{7/2})$$

Part C

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

$$\sum_{i=1}^n \sum_{j=1}^n O(\log n)$$

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

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

$m = m + m$

$$1 \quad 1+1=2$$

$$2 \quad 2+2=4$$

$$4 \quad 4+4=8$$

$$8 \quad 8+8=16$$

$$\vdots$$

$$2^n$$

adding to Part D

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

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

Size = 10	10
$3(10)/2$	15
Size = 15	22
$3(15)/2$	23

Size increases ≈ 22
 by roughly $3(22)/2$
 1.5 so $66/2 = 33$
 so $4 \log_{1.5}(n)$

When copying into bigger array
 the number of times it is 0
 ran is about $O(n)$ because
 the largest term is n .

Size = n

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

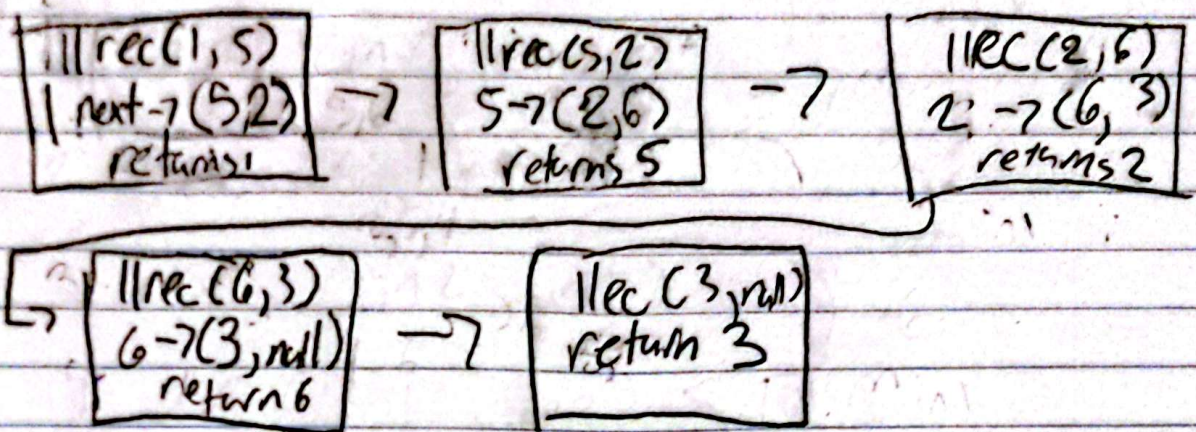
$$O(n)$$

Linked List + Recursion Tracing

question a

llrec

LLS in1 = 1, 2, 3, 4 in2 = 5, 6



Each value as we recurse up
is prepended

llrec returns 1 -> 5 -> 2 -> 6 -> 3

Question B

in1 = null ptr in2 = 2

