Hailey Tien
CS104 HW1

1 a) $2^2 = 4$, $4^2 = 16$, $16^2 = 256$, ⋮

$i = 2^{2^{k-1}}$

$\log 2^{2^{k-1}} = \log n \to \Theta(\log(\log n))$

b) $\Theta(\sqrt{n}\,(n^3))$ $= \Theta(n^{3.5})$

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

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

$$\sum_{i=1}^{n} c = cn$$

$$n + \sum_{c=1}^{\sqrt{n}}\Theta(i^3) \quad — \quad n + \sum_{1}^{2}\Theta(i^3)$$

$$n + \sum_{c=1}^{\sqrt{n}}\Theta(c\sqrt{n}^3)$$

$$n + \sqrt{n}^3\sum_{c=1}^{\sqrt{n}}\Theta(c^3) \to n + \sqrt{n}^3\cdot\sqrt{n}^4 = \Theta(n + n^{7/2}) = \underline{\Theta(n^{7/2})}$$

c) $\Theta(n^2\log n)$

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

Assume the worst case for A[E]

first nested for loop $\to n^2$

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

d)

Initial : $O(n)$

If statement $\to$ true every k times

Initial size 10, resize : $3/2$

$$10,\ 10\cdot\tfrac{3}{2},\ 10\cdot\left(\tfrac{3}{2}\right)^2,\ \dots,\ 10\cdot\left(\tfrac{3}{2}\right)^k$$

$$\text{Sum} = \frac{a(1-r^n)}{1-r}$$

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

2 a) As long as the linked lists aren't empty, we are alternated the nodes of both into one linked list.

1 → 5 → 2 → 6 → 3 → 4

1st 1 → 5 → 2 → 6 → 3 → 4
2nd 5 → 2 → 6 → 3 → 4
3rd 2 → 6 → 3 → 4
4th 6 → 3 → 4
5th 3 → 4

b) just returns in2 because in1 is null

↓

2