HW 3

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1) $C(n) = aC(\frac{n}{b}) + \Theta(n^d)$ $a=8$ $b=2$

a) $f(n) = (\sqrt{n} + \lg n)^1 = (n + (\lg n)^2)^{\frac{1}{2}}$

$d = \frac{1}{2}$

& $2^{\frac{1}{2}} = 8 > \sqrt{2}$

$C(n) = \Theta(n^{\log_b a}) = \Theta(n^{\lg 8}) = \Theta(n^3)$

b) $(n + 8^{\lg n}) = (n + 2^{3 \lg n}) = (n + 2^{\lg n^3}) =$

$(n + n^3) = (n^3)(\frac{1}{n^2} + 1)$ $d = 3$

$8 = 2^3$

$C(n) \in \Theta(n^3 \lg n)$

c) $(\frac{\lg n}{n^3} + 1)^4 (n^4)$ $d = 4$

$8 < 2^4 = 16$

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

2) int tensmall(int arr[]) {

```
for(int i=0; i<arr.size(); i++){
    for(int j=i+1; j<arr.size(); j++){
        if(arr[i] > arr[j])
            swap(arr[i], arr[j]);
    }
}
return arr[9];
}
```

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

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

$$\in \Theta(n^2)$$

3) int tensmall(int arr[], int k){

```
int n = sizeof(arr) / sizeof(arr[0]);
if (k == 0)
    return arr[arr.size()-1];
sort(arr, arr+n, greater<int>());
tensmall(arr[0..arr.size()-2], k-1);
```

3

$$\sum_{i=0}^{10} 1 = 10 \cdot n$$

$$O(n)$$