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Homework-3

1. find the runtime of algorithm mathematically

Ans => so here outer runs n time

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

$$T(n) = 1 + (n+1)(n^2+n) + n^2$$

$$T(n) = 2 + 3n + 3n^2$$

2. In github code.

3. find polynomials that are upper and down bounds on your curve from #2

Ans =>

Big-O => the upper bound on graph shown by the green dashed line, which slightly exceeds the plotted curve.

Big-omega => so this represent the lower Bound on time complecity

so at growes atleast quadratically repest to n so $\Omega(n^2)$

Big theta: since both the upper and lower bounds are quadratic and closely follow the actual timing data, runtime is $\Theta(n^2)$.

4.) in github

```
x = f(n)
    x = 1;
    y = 1;
        for  i = 1:n
            for j = 1:n
                x = x+1;
                y = i+j;
```

4.) will this increase how long it takes the algorithm to run

Ans yes the modified function will take slightly more time to run because of operation y = i+j; within

inner loop. However, this operation is constant time O(1), and since it's executed same time as the other operation.

5. will it effect your results from #1

Ans=> so it will not effect the results as the time bounds will remain the same $O(n^2)$ so the criteria does not effect the complexity.