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CSE 122
HW3
Part 1

1. Find the running time $T(n)$ of:

```
for i = 3 to n - 5
    x = 5 * i
```

Cost	#
C1	n-6
C2	n-7

T(n) = C1(n-6)+C2(n-7)
T(n) = n(C1+C2)-6C1-7C2

2. Find the running time $T(n)$ of:

```
for i = 2 to n - 1
    i = i * i
    break
```

Cost	#
C1	1
C2	1
C3	1

T(n) = C1+C2+C3
T(n) = 1
However since there is a break statement technically T(n) = c.

3. Find the running time $T(n)$ of:

```
for k = 1 to n - 1
    max = a[k]
    for j = k + 1 to n
        a[j] = a[j] * max
    a[k] = a[j]
```

Cost	#
C1	n
C2	n-1
C3	[(n(n+1)/2]-1
C4	n(n-1)/2
C5	n-1

T(n) = C1(n)+C2(n-1)+ C3([(n(n+1)/2]-1)+C4(n(n-1)/2) + C5(n-1)
T(n) = C1n + C2n –C2 + C3((n^2+n)/2) – C3 + C4(n^2-n)/2 + C5n –C5
T(n) = n(C1+C2+C5) + (C3+C4) ((n^2+n)/2)– C2 – C5 –C3

4. Make sure to show your work for this problem on how you came up with the count for each line. Find the running time $T(n)$ of:

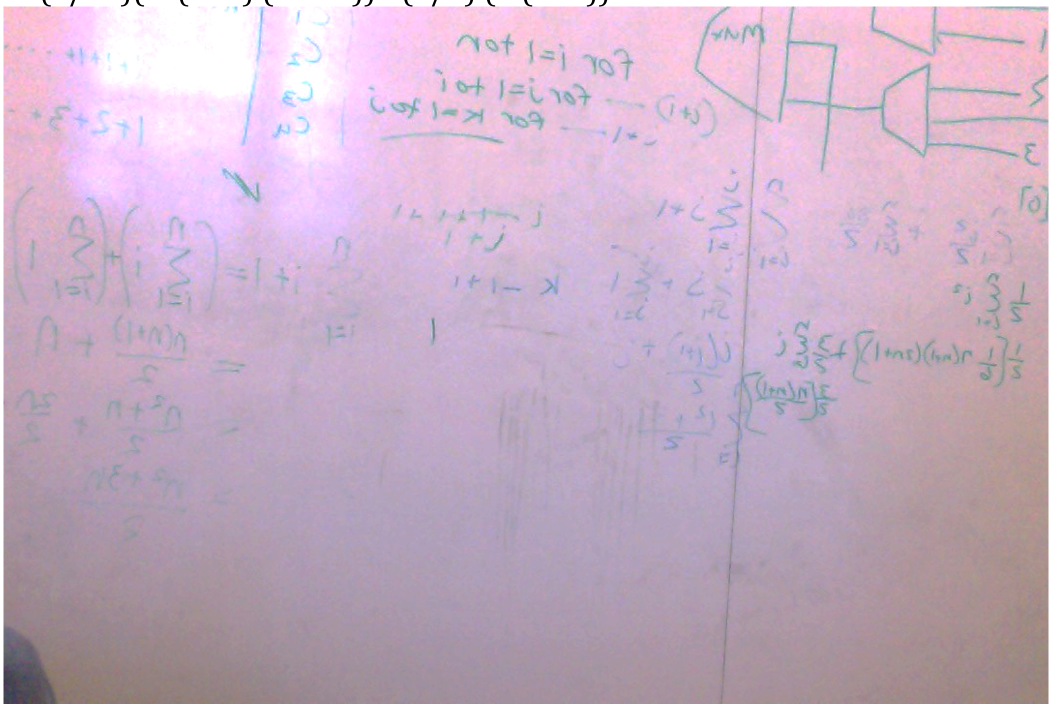
```
for i = 1 to n
    for j = 1 to i
        for k = 1 to j
            x = i * j * k
```

line	#
C1	n+1
C2	(n^2+3n)/2
C3	(¾) (n (1+n))+(1/12)(n (1+n) (1+2 n))
C4	(1/12)(n (1+n) (1+2 n)) +(1/4) (n (1+n))

Hmmm show our work… ill give it a try

C1 ((n-1)+1)+1 ((n)+1)	C2 Sum of i=1 to n Of i+1 = N(n+1)/2 +n =(n^2+3n)/2
C3 Sum from I =1 to n of the sum of j=1 to I of j +1 =i(i+1)/2 +i =(i^2+3i)/2	C4 Sum from I =1 to n of the sum of j=1 to I of j =i(i+1)/2 =(i^2+i)/2

$T(n) = C1(n+1) + C2((n^2+3n)/2) + C3((3/4)(n(1+n))+(1/12)(n(1+n)(1+2n)) + C4(1/12)(n(1+n)(1+2n)) +(1/4)(n(1+n))$



5. Define $f(n) = o(g(n))$ to mean that $\lim_{n\to+\infty} \frac{f(n)}{g(n)} = 0$

   Show that $\log n = o(n^{\epsilon})$ for any $\epsilon > 1$. Hint: use l'Hospital's Rule. Show your work and type your answer.

$\lim_{n\to+\infty} \frac{f(n)}{g(n)} = \lim_{n\to+\infty} (\log n)/(n^{\varepsilon}) = \lim_{n\to+\infty} (1/n)/\varepsilon n^{\varepsilon-1} = \lim_{n\to+\infty} 1/(n(\varepsilon n^{\varepsilon-1}))$

$= \lim_{n\to+\infty} 1/n^{\varepsilon} = 0$

since $\varepsilon>1$