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CSC 340

Assignment #5

Q1

Equation	Time complexity
double sum_triples(double array[], int n){	
1. double sum = 0;	1. 1
2. for (int i=0; i<n; i=i+3)	2. n/3 + 1
3. sum = sum + array[i];	3. n/3
4. return sum;	4. 1
}	

Line 2:

n	Executes
0	1
3	2
6	3
9	4

= n/3 + 1

Line 3: Executes one less than Line 2 = n/3

WORK

Q2

Equation	Time complexity
double sum_exponentials(int n){	
1. int sum=0;	1. 1
2. for (int i=1; i<n; i=i*2)	2. $\log_2 n + 1$
3. sum = sum + i;	3. $\log_2 n$
4. return sum;	4. 1
}	

Line 2:

n	Executes
0	0
2	2
4	3
8	4
16	5

= $\log_2 n + 1$

Line 3: $\log_2 n + 1 - 1$

$\log_2 n$

WORK

Q3

Equation	time complexity
1. for (int i=0; i<10; i++)	1. 11
2. for (int j=0; j<n; j++)	2. 10(n+1)
3. cout << i << ", " << j << endl;	3. 10(n)

WORK:

Line 1: Loops 10, + 1 to make statement false = executes = 11

Line 2:

n	executes
1	2
2	3
3	4
4	5
5	6

= n+1

Line 3: n+1 -1 ; executes one less

Q4

Equation	time complexity
1. for (int i=0; i<n; i++)	1. n+1
2. for (int j=0; j<n; j++)	2. (n)(n+1)
3. cout << i << ", " << j << endl;	3. (n)(n)

WORK:

Line 1:

n	executes
1	2
2	3
3	4
4	5
5	6

= n+1

Line 2:

n	executes
1	2
2	3
3	4
4	5
5	6

= n+1

Line 3: Line 3 execute one less,

n+1 -1 = n

Q5

Equation

```
1. for (int i=0; i<n; i++)
2.     for (j = n/2; j>i; j--)
3.         sum = i+j
```

time complexity

1. $n+1$
2. $\left[\left[\sum_{i=0}^{n/2} i\right]+1\right]$
3. $\left[\sum_{i=0}^{n/2} i\right]$

WORK:

// Each circle and line represents what i value is after each time line is read

Line 1:

n	i	executes
2	1 2	3
4	1 3 2 4	5
6	1 3 5 2 4 6	7

Line 2:

n	Execution
2	j = 1+1
4	j = 2+1+1
8	j = 4+3+2+1
16	j = 8+7+6+5+4+3+2+1+1
32	j = 16+15+14...

$$= \left(\sum_{i=0}^{n/2} i\right) + 1$$

Q6

Equation

```
double sum_matrix (double matrix[], int m, int n)

1. double sum = 0;
2.   for (int i = m-1; i >= 0; i--) {
3.       for (int j = n-1; j >= 0; j--) {
4.           sum = sum + matrix[i][j];
         }
     }
```

time complexity

1. 1
2. $m+1$
3. $(m)(n+1)$
4. $(m)(n)$

WORK:

// circles in i and j in lines 1 and 2 represent each time line executes

Line 2:

m	i	executes
2	2 1	2
4	4 3 2 1	4
8	8 7 6 5 4 3 2 1	8
16	16 15 14 13 12 11 10 9 8 7 6 5 4 3 2 1	9

$= m+1$

Line 2:

n	j	executes
2	2 1	2
4	4 3 2 1	4
8	8 7 6 5 4 3 2 1	8
10	10 9 8 7 6 5 4 3 2 1	10

$n+1$

Line 3: $\log_2 n + 1 - 1$

$\log_2 n$