3) i

```
           1
1  sum=0
           1      n     n
2. for(i=0; i<n; i++){
                 1
3        sum++;
   }
```

line	occ	
1	once	1
2	once	1+n+n
3	n	1

$1+1+1+n+n$

$2n+3$

Complexity - $O(n)$

ii

```
1  sum=0
2  for(i=0; i<n; i++){
3      for(j=0; j<n; j++){
4          sum++;
       }
   }
```

line	occ.		
1	1	1	1
2	1	1+n+n	1+n+n
3	n	1+n+n	$1+n^2+n^2$
4	n^2	1	n^2

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

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

$2n+2 + 3n^2+n$

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

$O(n) = \boxed{O(n^2)}$

ooo

```
1   sum=0
2   for(i=0; i<n; i++){
3       for (j=0; j<i; j++){
4           sum++;
        }
    }
```

line	occ		
1	1	1	1
2	1	1, n, n	$1+n+n$
3	n	1, ½n, ½n	$n+\frac{1}{2}n^2+\frac{1}{2}n^2$
4	½n	1	½n

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

$2n+2 + n^2 + \frac{3}{2}n$

$t(n) = n^2 + \frac{7}{2}n + 2$

$O(n) = O(n^2)$

iV

```
1  sum=0
2  for (i=0; i<n*n; i++){
3      for (j=0; j<n*n; j++){
4          sum;
       }
```

line	occ		
1	1	1	1
2	1	1, n^2, n^2	$1+2n^2$
3	n^2	n, n^2, n^2	$n^2(1+2n^2)$
4	n^4	1	n^4

$$1+(1+2n^2)+(n^2+2n^4)+n^4$$

$$2n^2+2 + 2n^4+n^2+n^4$$

$$t(n)= 3n^4+3n^2+2$$

$$O(n)= n^4$$