ENGBIND, KATE P.

1. FIND T(n)

```
int findSum(int n) {
    int i, j, sum = 0;
    for (i = 1; i <= n; i++) {          → 2n + 3
        for (j = 1; j <= n*n; j++) {    → 5n^2 + 3
            sum = sum + j; } }
    return sum; }
```

$$\sum_{i=1}^{n} (5n^2 + 3) + 2n + 3$$

$$5n^3 + 3n + 2n + 3$$

$$T(n) = 5n^3 + 5n + 3$$

2.

```
int findSum(int n)
    int i, j, prod = 1, sum = 0;
    for (i = 1; i <= n; i++) {          → 2n + 4
        for (j = 1; j <= i; j++) {
            sum = sum + j;              → 6i + 1
            prod = prod * j; } }
    return sum; }
```

$$\sum_{i=1}^{n} (6i + 2) + 2n + 4$$

$$\frac{6n^2}{2} + 2n + 2n + 4$$

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

3.

```
int findSum(int n)
    int i, j, sum = 0;
    for (i = 1; i <= n; i++) {          → 2n + 3
        for (j = 1; j <= i; j++) {      → 2i + 2
            for (k = 1; k <= j; k++) {  → 4j + 2
                sum = sum + j; } } }
    return sum; }
```

$$\sum_{i=1}^{n} (4j + 2) + 2i + 2$$

$$\frac{4n^2}{2} + 2n + 2i + 2$$

$$\sum_{i=1}^{n} (2n^2 + 2n + 2i + 2) + 2n + 3$$

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

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

3. PROVE OR DISPROVE THE FF:

(a.) $T(n) = 12n + 4$ is $\Theta(n)$

O: $\frac{12n+4}{n} <= C \cdot n$ $\quad n_0 = 1$ $\quad C = 16$

$12 + \frac{4}{n} <= C$

$12 + 4/n <= 16 \cdot n$

$\therefore T(n)$ is $O(n)$

Ω: $\frac{12n+4}{n} >= C \cdot n$ $\quad n_0 = 1$ $\quad C = 12$

$12 + 4/n >= C$

$12 + 4/n >= 12 \cdot n$

$\therefore T(n)$ is $\Omega(n)$

$\therefore T(n)$ is $\Theta(n)$

(b.) $T(n) = 15n^2 - 9n$ is $\Theta(n^2)$

O: $\frac{15n^2 - 9n}{n^2} <= C \cdot n^2$ $\quad n_0 = 1$ $\quad C = 15$

$15 - \frac{9}{n} <= C$

$15 - \frac{9}{n} <= 15 \cdot n^2$

$\therefore T(n)$ is $O(n^2)$

Ω: $\frac{15n^2 - 9n}{n^2} >= C \cdot n^2$ $\quad n_0 = 1$ $\quad C = 6$

$15 - \frac{9}{n} >= C$

$15 - \frac{9}{n} >= 6 \cdot n^2$

$\therefore T(n)$ is $\Omega(n^2)$

$\therefore T(n)$ is $\Theta(n^2)$

(c.) $T(n) = 12n + 4$ is $O(n^2)$

O: $\frac{12n+4}{n^2} <= C \cdot n^2$ $\quad n_0 = 1$ $\quad C = 16$

$\frac{12}{n} + \frac{4}{n^2} <= C$

$\frac{12}{n} + \frac{4}{n^2} <= 16 \cdot n^2$

$\therefore T(n)$ is $O(n^2)$

(d.) $T(n) = 15n^2 - 9n$ is $O(n)$

O: $15n^2 - 9n <= C \cdot n$ $\quad n_0 = 1$

$15n - 9 <= C$ $\quad C = 15$

$15n - 9 <= 15 \cdot n$

$\therefore T(n)$ is not $O(n)$