

1. Give the lowest bound for the running time of the following code fragments, using $O()$ notation. Your answers should be chosen from $O(n)$, $O(n^2)$, $O(n^3)$, $O(2^n)$, $O(n \log n)$, $O(1)$, or $O(\log n)$.

(a)

```
for (i = 0; i < n; i++) {
    for (j = 0; j < n; j++) {
        c[i][j] = 0.0;
        for (k = 0; k < n; k++) {
            c[i][j] = c[i][j] + a[i][k]*b[k][j];
        }
    }
}
```

$O(n^3)$

(b)

```
for (j = 0; j < n; j++) {
    cout << j;
}
for (k = n; k > 0; k--) {
    cout << k;
}
```

$O(n)$

2. Show that the formula $6n^3 + 25n + 143 + 2n^2$ is $O(n^3)$ (i.e., argue that this formula is $O(n^3)$ by using the definition of what it means to say that $f(n) = O(g(n))$).

To show that $6n^3 + 25n + 143 + 2n^2$ is $O(n^3)$, we need to find a constant c such that

$$6n^3 + 25n + 143 + 2n^2 \leq cn^3$$

for all sufficiently large n . Pick any value for c greater than 6 (e.g., 7 will do).