CSCI 3333 Practice Quiz STL

Problem 1. Select the running time for each of the following vector methods.

Accessing an element of the vector (via operator[]).  □ Θ(1)  □ Θ(n)

Adding an element to the back of the vector (via push_back).  □ O(1)  □ O(n)

Removing an element from the back of the vector (via pop_back).  □ Θ(1)  □ Θ(n)

Removing an element from the front of the vector (via erase).  □ Θ(1)  □ Θ(n)

Problem 2. Complete the following function that replaces every element of a vector V with the sum of the elements of V:

```cpp
void replace_with_sum(vector<int> _____V) {
    if (V.size() == _____) return;

    int sum = 0;
    for (int x : _____) sum += x;

    for (int i = 0; i < V._____(); ++i)
        V[i] = _____;
}
```

For instance, the following tests should pass:

```cpp
vector<int> V{1, 2, 3};
replace_with_sum(V);
test(V.size() == 3);
test(V[0] == 6);
test(V[1] == 6);
test(V[2] == 6);
```

Let n be the length of V.  The running time of `replace_with_sum` is:  □ Θ(1)  □ Θ(n)  □ Θ(n^2)
**Problem 3.** Complete the following function that replaces each element of a vector V with two copies of the element:

```cpp
void duplicate(vector<_____> &V)
{
    vector<string> C = V;
    V.clear();
    while (C.size() > 0)
    {
        V.push_back(C[_____] );
        V.push_back(C[_____] );
        C._____();
    }
}
```

For instance, the following tests should pass:

```cpp
vector<string> V{"dog", "cat", "bird"};
duplicate(V);
test(V.size() == 6);
test(V[0] == "dog");
test(V[1] == "dog");
test(V[2] == "cat");
test(V[3] == "cat");
test(V[4] == "bird");
test(V[5] == "bird");
```

Let $n$ be the length of V. The running time of `duplicate` is:  

- $\Theta(1)$
- $\Theta(n)$
- $\Theta(n^2)$
Problem 4. Complete the following template function that returns the sum of the elements of an array \( A \) of length \( n \):

\[
\text{template <typename _____> _____ sum(_____* A, int n)}
\]

\[
\{ \\
\quad \text{if (n == 0)} \\
\quad \quad \text{return _____();} \\
\quad _____ tot = A[0]; \\
\quad \text{for (int i = 0; i < n; ++i)} \\
\quad \quad _____ += A[i]; \\
\quad \text{return _____;} \\
\}
\]

For instance, the following tests should pass:

\[
\text{int A[]} \{1, 2, 3\}; \\
\text{test(sum(A, 3) == 6);} \\
\text{string B[3]} \{"\text{dog}\", "\text{cat}\", "\text{bird}\"\}; \\
\text{test(sum(B, 3) == "\text{dogcatbird}");} \\
\]

The running time of \( \text{sum} \) is: \( \square \Theta(1) \quad \square \Theta(n) \quad \square \Theta(n^2) \)