1. Show that \( f(x) = 17 + 3x + 21x^2 \) is \( O(x^2) \) using witnesses \( C \) and \( k \)

2. What is the complexity of a program to sort a list of 4 numbers, why?

3. Two ways of implement queues and stacks are with a reference based implementation and with an array based implementation. For both of these implementations, what is the order of each of the following tasks in the worst case?
   - adding an item to a stack of \( n \) items
   - adding an item to a queue of \( n \) items

4. What is the complexity of a program that counts the 1-bits in a bit string by looking at each bit, one at a time? Count both comparisons and arithmetic operations.

5. Given an integer array, \( a[] \), of size \( n \), and some integer value \( x \), what is the complexity of the following code? Count both comparisons and arithmetic operations
   
   ```
   int pow = 1;
   in val = a[n-1];
   for (int i = n-2; i >= 0; i--) {
       pow *= x;
       val += pow * x[i];
   }
   ```

6. Find the recurrence relation for each of these sequences:
   - 1, 3, 9, 27, 81, 243 ...
   - 1, 7, 19, 43, 91, 187 ...

   ```