Problem 1: (30 points) Implement a linked list based Stack class using the following definition.

```cpp
class Stack
{
private:
    class Node
    {
        public:
            //put the pointer and data in here
    
    
    Node *Top;
public:
    //setup initial conditions
    Stack();
    
    //delete all dynamic memory, etc.
    ~Stack();
    
    //add x to top of the stack
    void Push(char x);
    
    //remove the top item from the stack and return it
    char Pop();
    
    //return true if the stack is empty, otherwise return false
    bool empty();

};
```

Problem 2: (30 points) Write a program that takes any string from the user and runs the palindrome test on it. We discussed this algorithm in class. This should use two stacks created using the class from Problem 1.

The basic process is:
1. Push the string onto one stack
2. Pop half the stack and push it onto the second stack
3. Check the parity issue
4. Pop both stacks simultaneously and compare
5. Output results
Problem 3: (10 points) Write a program that takes in a long integer in the range \([0, \ldots, 1,000,000,000]\) and outputs its binary equivalent using a function with an iterative loop and a stack. If the number is too large it should tell the user. You can use the stack STL template class for this problem.

Problem 4: (30 points) Similar to Lab 7, write a program that takes in a decimal number, a new base, and a digit and then returns the number of matching digits in the number in the new base. For instance 232223 has 4 2's in base 10, 15 has 4 1's in base 2. Assume that 10 is the largest base. This must be implemented iteratively with a stack. You can use the stack STL template class for this problem.

Bonus: (10 points) Modify Problem 2 to work if you ignore spaces, apostrophes, quotation marks, commas, periods, etc., and to not distinguish between capital and lowercase letters. It should only compare letters.

Bonus: (2 points) Favorite video game?