CS4510: HW1

Due: Aug 26th before 3pm on Gradescope (there is a link on Canvas).

1. Recognition. [2 points]
Write a program (in your favorite language or pseudocode) that takes as input a finite binary string and outputs "YES" if the string contains one of the following as a substring (in consecutive positions) and outputs "NO" if it does not: $\{010, 101, 0110, 1001\}$. Prove that your program is correct on all possible input binary strings.

2. Meta-Recognition. [2 points]
Write a program that takes as input a finite list of binary strings and outputs a program that takes a binary string as input and outputs "YES" if it contains a string on the list as a substring and "NO" otherwise.

3. Space and Time. [2 points]
How much space (memory) does your first program take on inputs with n bits? How much time does it take as a function on n? Make all your assumptions explicit. You can use $O(.)$ notation.
(Bonus) What about your second program?