

Here are the in-class exercises we worked out (using the pumping lemma based proving technique) to show that a given language is not regular. Please try to work them out for yourself.

1) $L_1 = \{ w \mid w \text{ is a binary string with equal number of zeros and ones} \}$

2) $L_2 = \{ w \mid w \text{ is a binary string of the form } 0^n 1^n, \text{ where } n \geq 1 \}$

Note: L_1 is not the same as L_2

3) $L_3 = \{ w \mid w \text{ is a binary string of the form } 0^n 10^n, \text{ where } n \geq 1 \}$

4) $L_4 = \{ w \mid w \text{ is a binary string of the form } 0^m 1^n, \text{ where } m < n \text{ and } m, n \geq 0 \text{ integers} \}$

5) $L_5 = \{ w \mid w \text{ is a binary string of the form } 0^n, \text{ where } n \text{ is a perfect square (i.e., } n = i^2, \text{ for } i \geq 1 \}$