Problem 1 (Regular Grammars). Give regular grammars for the following languages.

(a) \( L_1 = L((ab^*aabb^*a)^* + (bba^*b)) \).

(b) \( L_2 = \{a^nb^m : n + m = 2k, \text{ and } n, m, k \geq 0\} \).

Problem 2 (Pumping Lemma). Use the pumping lemma to prove that the following languages are not regular.

(a) \( L_3 = \{a^n b^l : n < l + 3, \text{ and } n, l \geq 0\} \).

(b) \( L_4 = \{wwww : w \in \{a, b\}^*\} \).

(c) \( L_5 = \{a^n : k = \sqrt{n}, \text{ where } n \text{ and } k \text{ are both integers with } n, k \geq 1\} \).