1. Consider the HS algorithm. (See copy from the book that is attached.) If \( x(i) = \) number of hops traversed in either direction (clockwise and counter clockwise) during phase i, then \( x(i+1) = k \cdot x(i) \) for some \( k > 2 \). What is the message complexity of the algorithm?

2. For the LCR algorithm, show an assignment of ids for which the algorithm uses \( O(n) \) messages.

3. In synchronous rings when \( n \) is unknown, give a distributed algorithm to find the value of \( n \). (\( n = \) number of nodes.) State any assumptions.