1. In choosing a toilet stall in a public bathroom, people want privacy and refuse to use one adjacent to an occupied stall. So, given a row of \( n \) stalls, the first person to arrive will choose an end stall and the second to arrive will choose the opposite end stall. From then on, anybody arriving makes the greedy choice of the stall furthest away on each side of occupied stalls; if all remaining stalls are adjacent to an occupied stall, the person just leaves. Let \( U(n) \) be the maximum number of people that this protocol can service; analyze \( U(n) \).

2. Professor Reingold is planning to have \( n \) problems on Exam 3. There happen to be exactly \( n \) students in the course and each has discovered a different one of the exam problems. The students want to share their information by sending email, so that every student knows every problem. Assume that a student includes all the problems she/he knows at the time a message is sent and that email can go only to one recipient.

   (a) Give a greedy algorithm organizing the email communication, trying to minimize the total number of email messages for the students to fully share their knowledge.

   (b) Prove that your greedy algorithm results in the fewest messages possible, or give an example where it does not.