Math 107, Week 1 Questions to Practice

Let us consider the following system of m linear equations in n variables.

$$\begin{aligned} a_{11}x_1 + a_{12}x_2 + \cdots + a_{1n}x_n &= b_1 \\ a_{21}x_1 + a_{22}x_2 + \cdots + a_{2n}x_n &= b_2 \\ &\vdots \\ a_{m1}x_1 + a_{m2}x_2 + \cdots + a_{mn}x_n &= b_m \end{aligned}$$

(i) (Underdetermined linear systems) Suppose $m < n$. Show that the linear system cannot have a unique solution.

(ii) (Overdetermined linear systems) Suppose $m > n$. What are the possibilities regarding the number of solutions?

Solve the following questions from the orange textbook by Lay, Lay and McDonald
1.1 : 11, 33, 34
1.2 : 2, 3, 12, 15, 16, 33
1.3 : 10, 11, 12