1. Let $R$ be a symmetric and transitive relation on a set $A$. (These assumptions apply to both parts (a) and (b) of this problem.)
   1. Show that $R$ is not necessarily reflexive.
   2. Suppose that for every $a \in A$, there exists $b \in A$ such that $aRb$. Prove that $R$ is reflexive.

2. Let $R$ be a relation on a set $A$. Then $R = (A \times A) - R$ is also a relation on $A$. Prove or disprove each of the following statements:
   1. If $R$ is reflexive, then $\overline{R}$ is reflexive.
   2. If $R$ is symmetric, then $\overline{R}$ is symmetric.
   3. If $R$ is transitive, then $\overline{R}$ is transitive.

There is one additional problem, quite a challenging one, that we suggest you think about; however, you do not need to hand in your solution (it will not be graded). Talk to your instructor about your solution to this problem if you like!

- Hammack, Section 11.2, #14