MATH 220 (all sections)—Homework #9
due Friday, November 10, 2017

- Hammack, Section 11.1, #2
- Hammack, Section 11.1, #8
- Hammack, Section 11.1, #10
- Hammack, Section 11.2, #10
- Hammack, Section 11.2, #12
- Hammack, Section 11.3, #4
- Hammack, Section 11.4, #4

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 $\overline{R} = (A \times A) - R$ 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