Assignment 12, Math 240, Fall 2005

Due: 2:45pm, November 1. Value: 24 pts.

Based on October 25 material (§7.1, §7.3)

Problem A. §7.1 (p 481): 34abc. Your answers should be in the "set builder" notation which was also used to define $R_1 \ldots R_6$ just previous to #32.

Based on October 27 material (§7.5)

Problem B. §7.5 (p 513): 2bce. For each that is not an equivalence relation, name the properties the relation lacks, and explain why it lacks the property using a brief counterexample.

Problem C. Characterize the matrices corresponding to equivalence relations. That is, what particular property(ies) of a matrix tell you whether it corresponds to an equivalence relation or not? (Hint: What if you list the rows and columns in the same order, where elements of the same equivalence class are adjacent?)

Problem D. Suppose we define a relation $\approx$ on $\mathbb{R}$ where $a \approx b$ if $|a - b| < 0.1$.

a. Is $\approx$ reflexive? Why or why not?

b. Is $\approx$ symmetric? Why or why not?

c. Is $\approx$ transitive? Why or why not?

Problem E. Given an arbitrary relation R from A to B, suppose we define a new relation S on A where $(a_1, a_2) \in S$ if there is a $b \in B$ such that $(a_1, b) \in R$ and $(a_2, b) \in R$.

a. Is S necessarily reflexive? Why or why not?

b. Is S necessarily symmetric? Why or why not?

c. Is S necessarily transitive? Why or why not?

Problem F. §7.5 (p 515): 44.