CSE 321: Discrete Structures
Assignment #8
Due: Wednesday, June 1

Reading Assignment: Chapter 8 of Rosen.

Problems:

1. Let R be the relation on the set of ordered pairs of positive integers such that $((a, b), (c, d)) \in R$ if and only if $ad = bc$. Show that R is an equivalence relation.

2. For the relation $R = \{(b, c), (b, e), (c, e), (d, a), (e, b), (e, c)\}$ on $\{a, b, c, d, e\}$, draw the following relations in digraph form:

   (a) The reflexive closure of R.

   (b) The symmetric closure of R.

   (c) The transitive closure of R.

   (d) The reflexive, symmetric, transitive closure of R.

3. Let R be a random relation on a set $A = \{a_1, a_2, \ldots, a_n\}$ selected as follows: Independently, for each pair i, j, $1 \leq i \leq n$ and $1 \leq j \leq n$, (a_i, a_j) is included in R with probability 1/2

   (a) What is the probability that R is reflexive?

   (b) What is the probability that R is irreflexive? (A relation R on A is said to be irreflexive if for every $a \in A$, $(a, a) \notin R$.)

   (c) What is the probability that R is symmetric?

   (d) What is the probability that R is anti-symmetric?

4. Section 8.1, exercise 26.

5. Section 8.4, problem 22.

6. Section 8.5, exercise 26.

7. Section 8.7, exercise 16