

CS 173: Discrete Mathematical Structures, Spring 2010

Honors Homework 4

Due by 5pm on Wednesday May 5th. Please give to Margaret or push it under the door of Margaret's office (3214 Siebel).

Some of this requires drawing graphs. A good tool for doing this in latex is the `gastex` package. See pointers on the 173 latex information subpage. There isn't a proper manual for `gastex`, so the fastest method is to copy-code from examples. The source for homeworks 9 and 10 contain some examples and there's a whole bunch of examples on the `gastex` page.

However, if you run short on time, just format the textual parts in latex and draw the diagrams by hand (e.g. on the latex printout or on a separate page).

1 Background

Read the four scanned pages (from the textbook by Norman Biggs) posted on the web page. You may also want to remind yourself (e.g. from the text or lecture notes) what it means for a graph to be bipartite.

A Latin square of order n is an n by n array whose entries are taken from a set of n symbols. Each symbol must occur exactly once in each row and exactly once in each column. For example, the following is a latin square of order 5.

A	B	C	D	E
B	C	A	E	D
C	D	E	A	B
D	E	B	C	A
E	A	D	B	C

Latin squares are useful for designing a sequence of experiments that systematically cover a range of conditions without requiring excessive numbers of trials.

2 To do

Do Exercises 1 and 4 from section 17.2.

Also use the edge-coloring method to extend the following latin rectangle to a 5 by 5 latin square. Show your completed 5 by 5 square and also a picture of the bipartite graph coloring (as in the middle part of figure 17.6). I found that it was helpful to draw the graph with the symbols or the columns out of order, so as to minimize the number of crossing lines.

A	B	C	D	E
C	D	B	E	A
B	C	E	A	D