Math 390: Practice Problems for Quiz 2

Problems from the book

<u>4th Edition</u>

Section 17: 17.1, 17.3

Section 21: 21.1, 21.2(i)

Section 29: 29.4

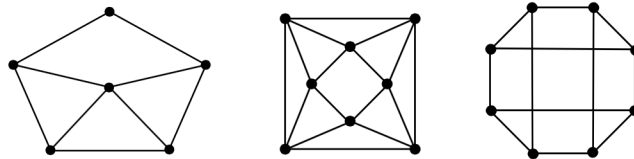<u>5th Edition</u>

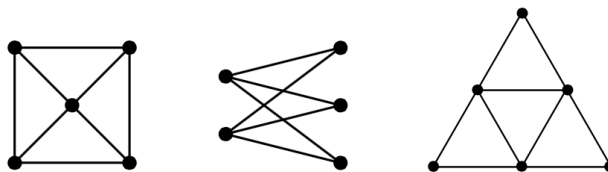*Section 5.1:* 5.1, 5.3

Section 5.2: 5.9, 5.11(i)

Section 6.3: 6.21

Additional Problems

1. For each of the following graphs, compute the chromatic number $\chi(G)$ of the graph, and show a coloring that uses the minimum number of colors.
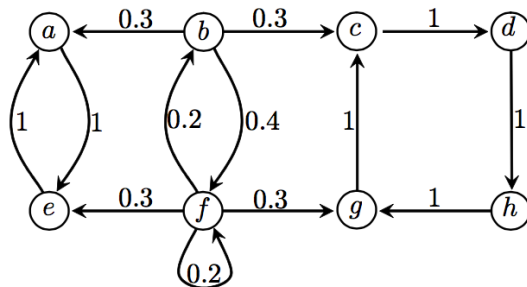

2. For each of the following graphs, compute the chromatic index $\chi'(G)$ of the graph, and show an edge-coloring that uses the minimum number of colors.


3. For each of the following graphs, compute the chromatic polynomial $P_G(k)$.
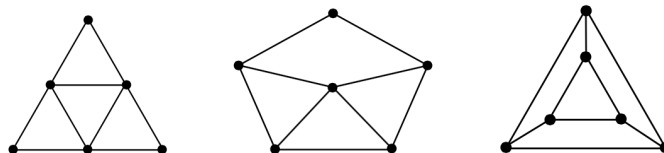
4. Consider the following Markov chains:

(a) Which states in the Markov chain are persistent? Which states are transient?

(b) For each state of the Markov chain, determine whether the state is periodic. If it is periodic, what is its period?

(c) Is the Markov chain ergodic?

5. Consider the following Markov chains:
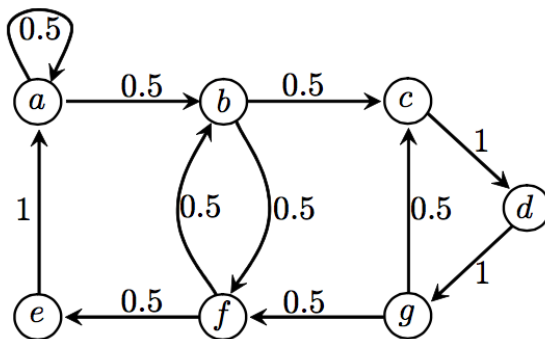
(a) Which states in the Markov chain are persistent? Which states are transient?

(b) For each state of the Markov chain, determine whether the state is periodic. If it is periodic, what is its period?

(c) Is the Markov chain ergodic?

6. There are two competing cellphone companies in a city, Company A and Company B. In 2015, 40% of the people in the city use Company A, and 60% of the people use Company B. Each year 40% of the people who who use Company A switch to using Company B, and 30% of the people who use Company B switch to using Company A. (Assume that everyone in the city has a cellphone with either Company A or Company B.)

(a) Model this situation with a Markov chain. Find the transition matrix and associated digraph that describes the number of people using each company.

(b) What percent of people will use Company A in 2016?

(c) Assuming the trend continues, what fraction of people will use Company A in the long run?

7. Consider the following network:
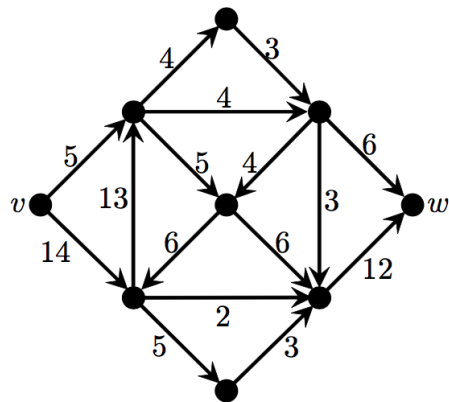
(a) Find a maximum flow in the above network.

(b) Fine a minimum cut in the above network.