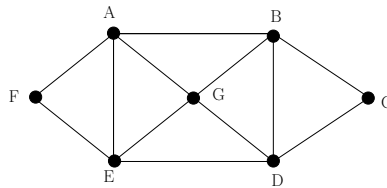


Homework 6b

Math 118 section 004

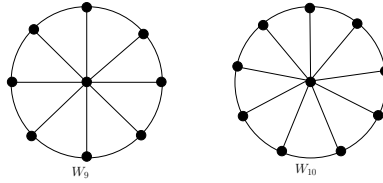
Due: Friday, April 4th, 2008

1. In the following figure is the graph G .



- (a) Using Brook's Theorem, find a bound on the chromatic number of the graph, $\chi(G)$.
- (b) Find a colouring using the number of colours you found above.

2. Below are the graphs of W_9 and W_{10} , the so-called "wheel" graph.



- (a) Find $\chi(W_9)$ and $\chi(W_{10})$.
- (b) Find an optimal colouring of the two graphs.
- (c) W_n is defined as the wheel with n vertices. This graph has one vertex in the middle, surrounded by $n - 1$ vertices. It has edges around the outside of the "wheel", and edges connecting each vertex to the center like spokes. Find $\chi(W_n)$ for general n .
- Hint: Consider the two figures above, as well as the graphs of C_n

3. Four curling teams (totalling 16 people) need to travel from Halifax to Toronto for a tournament. They plan on driving, and have four cars they can take. However, not all of players get along with each other (and not even players on the same team necessarily get along).
- (a) Listed below is the people who don't get along. Draw the friendship graph for this situation.
 - (b) Find a way for the 16 players to fit in four cars by finding a 4-colouring for this graph.
 - (c) So the teams aren't stuck reading a graph, write a list for who goes in what car.

The players Ashlea, Barry, Chelsea, Don, Emily, Frank, Georgina, and Howard have the following dislikes:

A doesn't get along with B, C, F, H

B doesn't get along with A, C

C doesn't get along with B, A, D, E

D doesn't get along with C, F

E doesn't get along with C, D, F

F doesn't get along with A, E, G

G doesn't get along with F, C, H

H doesn't get along with A, G

The rest of the players, Isabelle, Jason, Karla, Lenny, Mary, Nick, Olivia and Peter, get along with everyone.

4. Below is a blank map of Canada. Our goal is find a colouring of this map using as few colours as possible. First, draw the dual graph associated with this map. Use Brook's theorem to find a bound on the chromatic number of this graph. Next, either by trial and error, or using the greedy algorithm, find a colouring of the dual graph. Finally, find the associated colouring for the map.

*You may want to look at another map if you aren't sure about where exactly the borders of the provinces or territories might be, especially with all the little islands. **Just don't copy the colouring.***

