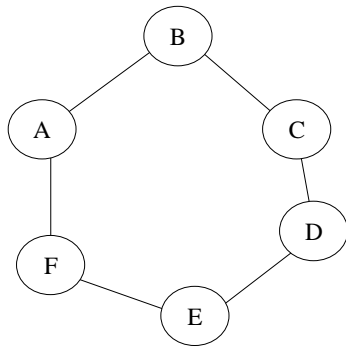# STA294 Homework 1

Due 1/25/99

Cite results that you use that are not in the assigned readings.
This problem set covers Chapters 4.1 – 4.4, 5.1 and 5.2

Triangulation and Moral Graphs

1. Consider the undirected n-cycle below:

    a.   (5 pts) Use MCS to triangulate this graph. For each cycle of the algorithm, write down the sequence of nodes visited and the fill edges added. What is the size of the largest clique?

    b.   (5 pts) Use node elimination to triangulate this graph. Record the node elimination order and the order that fill edges are added. What is the size of the largest clique? What is the size of the largest clique given ANY elimination order?

    c.   (5 pts) What is the largest n-cycle that can be a moralized DAG?

2. Considered the undirected graph below:
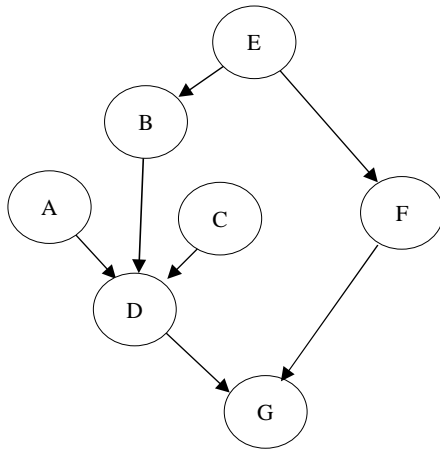
a. (5 pts) What is the moral graph for this DAG? Use MCS to triangulate this graph. For each cycle of the algorithm, write down the sequence of nodes visited and the fill edges added.

b. (5 pts) Use node elimination to triangulate this graph. Write down the node elimination order and the order that fill edges are added.

3. Elimination Orders

a. (5 pts) **Prove:** If a graph is triagulated, there is a perfect elimination order.

b. (10 pts) **Prove:** If there is a perfect elimination order, the graph is triangulated.

U and D-Separation

4. (10 pts) CFG Problem 5.1

5. (10 pts) CFG Problem 5.2

Bayes Ball

6. (10 pts) Using the graph in Figure 5.11, determine the nodes in N_e and N_p for the following queries: $P\{E\}$, $P\{E|H\}$, $P\{F\}$, $P\{F|A\}$, $P\{B|D,G\}$