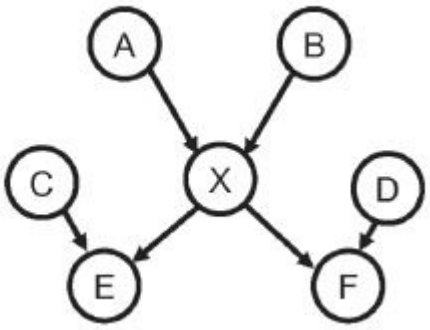
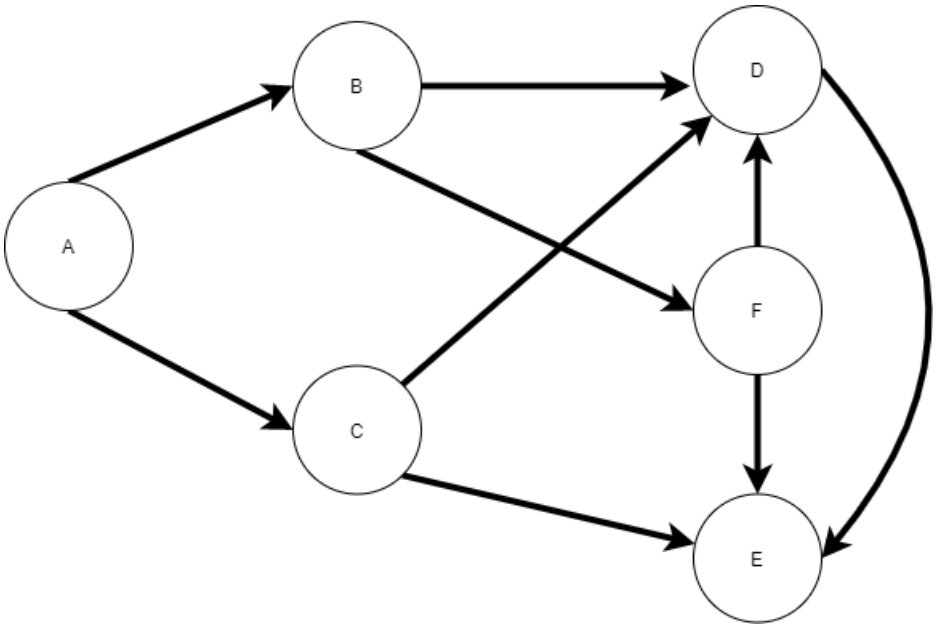
Assignment 10

Problem 1

Consider the DAG G in the following figure. Assume it is a minimal I-map for $p(A, B, C, D, E, F, X)$. Now consider marginalizing out X. That is, X is unobserved and we construct $p(A, B, C, D, E, F) = \sum_X p(A, B, C, D, E, F, X)$. Construct a new DAG G' which is a minimal I-map for $p(A, B, C, D, E, F)$. Specify (and justify) which extra edges need to be added. Discuss which pairs of variables are conditionally independent in your new graph.



Problem 2

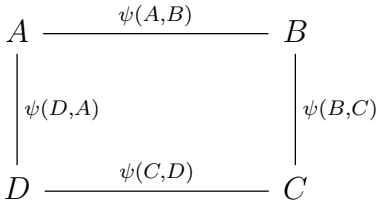


1. Convert the BN above to MRF.
2. Fill in the blanks to make a true statement: _____ and _____ are d-separated given _____ in the BN, but not d-separated in the MRF.

Assignment 10

Problem 3

Consider a MRF of 4 random binary variables A, B, C, D, corresponding to 4 students in a CMPT 727 study group. Each variable represents whether the student has a correct understanding of the EM algorithm.



The potential function tables are defined as follows:

(var1, var2)	$\psi(A, B)$	$\psi(B, C)$	$\psi(C, D)$	$\psi(D, A)$
(0,0)	100	10	1	10
(0,1)	1	1	10	1
(1,0)	1	1	10	1
(1,1)	100	50	1	20

This table is formed based on observation that A and B are good friends, so they are prone to the same understanding (either correct or incorrect); two other pairs (B,C) and (D,A) also tend to have same understanding but they are more likely be correct. C and D usually argue, and they are more likely to hold different opinions.

1. Calculate the partition function Z.
2. What is the probability that all students in this group have a correct understanding of the EM algorithm?

Problem 4

Please write one thing from this course so far that you found confusing, a topic you would like to hear more about, or something you found particularly interesting.