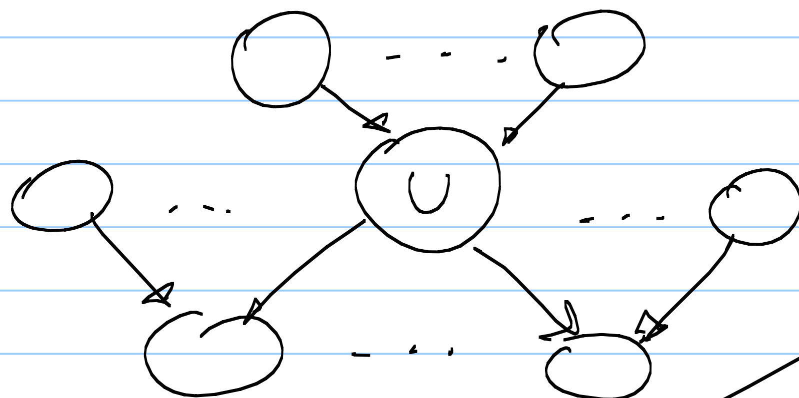
Note Title 2/2/2009

HW2: 2.1, 2.4, 2.5, 2.6, 2.7, 2.8, 2.9, 2.10, 2.12, 2.14.
due Friday, February 6, 2009

Exercises 2.7 & 2.8 use the definition of Markov blanket.

The Markov blanket of a node U in a BN $B = (V, E, P)$ is the set of nodes consisting of the parents of U, the children of U and the other parents of the children of U.



In any BN,

U is independent of any nodes other than U given its Markov blanket.

This is a property that you need to prove as part of exercise 2.8. You will show that the Markov blanket d-separates U from the rest of the BN.

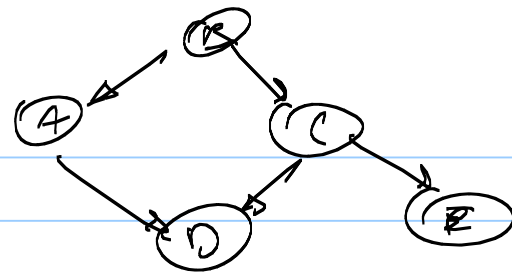
For exercise 2.9, you are asked to use a procedure to determine d-separation that does not require listing every chain between two nodes.

Key notion: ancestral graph. The anc. graph of A, B, C and the DAG $G=(V,E)$ is the graph induced by A, B, C and their ancestors in G.

To check whether A is d-separated from B by C in G:

1. create the ancestral graph of A, B, C in G
2. create the moral graph of the ancestral graph of (1)
3. check whether all paths from A to B are separated by C in the graph of (2).

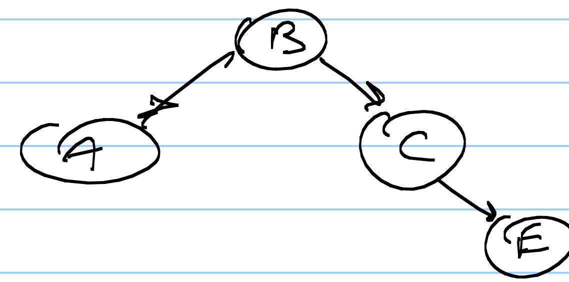
Moral graph of a DAG G is obtained by marrying parents and removing directions.



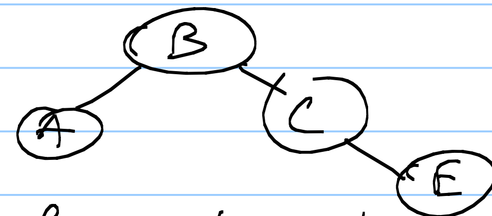
Is A d-sep. from E given B?

Ex 1

1. Find ancestral graph:



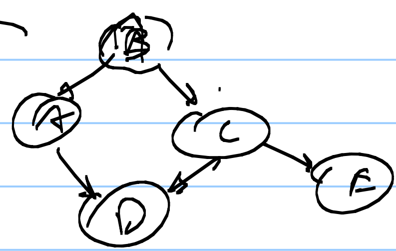
2. Moralize

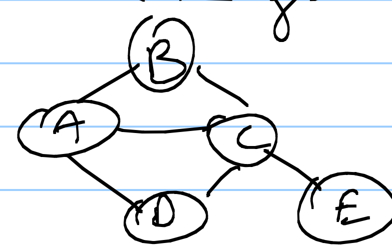


3. Check whether B intercepts all paths between A and E.

Ans.: yes   So, A is d-sep. from E given B

Ex. 2   A is d-sep from E given B and D

1. 

2. 

3. no. So, $\{B, D\}$ does not d-sep A from E.

$a * (b+c) = a*b + a*c$ (distributive property of product over sum)

→ used to justify the variable elimination procedure.