HW 2: 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 on 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 parents of the children of \( U \).
In any BN, 

$\mathbf{U}$ is independent of any nodes other than $\mathbf{U}$ 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 $\mathbf{D}$ separates $\mathbf{U}$ from the rest of the BN.
For exercise 2.9, you are asked to use a procedure to determine A-separation that does not require listing every chain between two nodes.

Key notion: ancestral graph. The ancestral 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 removing parents and removing directions.
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-separated from E given B.

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

1. 

2. 

3. No, so \( \{B, D\} \) does not d-separate A from E.
\[ a \times (b + c) = a \times b + a \times c \]  
\[\text{(distributive property of product over sum)}\]

This is used to justify the variable elimination procedure.