1. (Modified version of Exercise 3.1 in the textbook) Suppose you have three Boolean random variables $X_1, X_2, X_3$. Write out a discrete joint probability distribution $P(X_1, X_2, X_3)$ where for each $i \neq j$, we have that $(X_i \perp X_j) \in I(P)$, but we also have that $((X_1, X_2) \perp X_3) \notin I(P)$. This should be a table with $2^3$ rows (one for each combination of values for the three random variables). Explain your solution. [5 points]

2. Answer true or false to the following conditional independence statements using the graph below. For partial credit, show the paths that are blocked or not blocked. [15 points]
   a) $C \perp D \mid \{B,H\}$
   b) $I \perp C$
   c) $I \perp H \mid F$
   d) $B \perp E \mid \{D,G\}$
   e) $A \perp I \mid \{E\}$
3. (Exercise 3.7 in the textbook) Show how you could efficiently compute the distribution over a variable $X_i$ given some assignment to all the other variables in the network: $P(X_i|x_1, ..., x_{i-1}, x_{i+1}, ..., x_n)$. Your procedure should not require the construction of the entire joint distribution $P(X_1, ..., X_n)$. Specify the computational complexity of your procedure using Big-O notation. [10 points]

4. (Exercise 3.8 in the textbook) Let $\mathcal{B} = (\mathcal{G}, \mathcal{P})$ be a Bayesian network over some set of variables $\mathcal{X}$. Consider some subset of evidence nodes $Z$, and let $X$ be all of the ancestors of the nodes in $Z$. Let $\mathcal{B}'$ be a network over the induced subgraph over $X$, where the CPD for every node $X \in X$ is the same in $\mathcal{B}'$ as in $\mathcal{B}$. Prove that the joint distribution over $X$ ie. $P(X)$ is the same in $\mathcal{B}$ as in $\mathcal{B}'$. The nodes in $\mathcal{X} - X - Z$ are called barren nodes relative to $X$, because (when not instantiated) they are irrelevant to computations concerning $X$. [10 points]