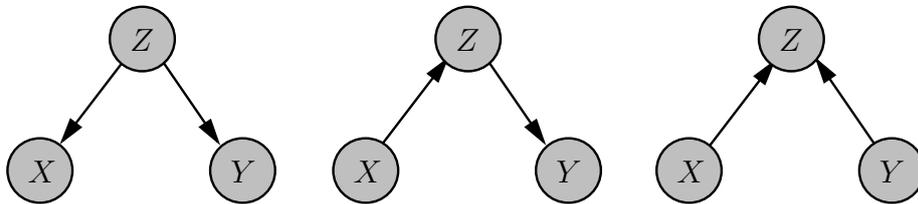


3 Artificial Intelligence II (SBH)

Let X , Y and Z be random variables. Denote by $X \perp Y \mid Z$ that X and Y are conditionally independent given Z .

- (a) Give *two* definitions of what it means to say that $X \perp Y \mid Z$, and prove that they are equivalent. [4 marks]
- (b) Prove that if $X_1, X_2 \perp Y_1, Y_2 \mid Z$ then $X_1, X_2 \perp Y_1 \mid Z$. [3 marks]
- (c) For each of the following Bayesian networks, state whether $X \perp Y \mid Z$ and justify your answer. [7 marks]



- (d) Give a detailed explanation of how a *Markov chain Monte Carlo algorithm* might be used to estimate an arbitrary inference for the following Bayesian network. [6 marks]

