

3. You can graduate only if you have completed the requirements of your major and you do not owe money to the university and you do not have an overdue library book. Express your answer in terms of  $g$ : “You can graduate,”  $m$ : “You owe money to the university,”  $r$ : “You have completed the requirements of your major,” and  $b$ : “You have an overdue library book.”
  
7. Express these system specifications using the propositions  $p$ : “The message is scanned for viruses” and  $q$ : “The message was sent from an unknown system” together with logical connectives (including negations).
  - a) “The message is scanned for viruses whenever the message was sent from an unknown system.”
  - b) “The message was sent from an unknown system but it was not scanned for viruses.”
  - c) “It is necessary to scan the message for viruses whenever it was sent from an unknown system.”
  - d) “When a message is not sent from an unknown system it is not scanned for viruses.”
  
9. Are these system specifications consistent? “The system is in multiuser state if and only if it is operating normally. If the system is operating normally, the kernel is functioning. The kernel is not functioning or the system is in interrupt mode. If the system is not in multiuser state, then it is in interrupt mode. The system is not in interrupt mode.”
  
21. When three professors are seated in a restaurant, the hostess asks them: “Does everyone want coffee?” The first professor says “I do not know.” The second professor then says “I do not know.” Finally, the third professor says “No, not everyone wants coffee.” The hostess comes back and gives coffee to the professors who want it. How did she figure out who wanted coffee?
  
39. A detective has interviewed four witnesses to a crime. From the stories of the witnesses the detective has concluded that if the butler is telling the truth then so is the cook; the cook and the gardener cannot both be telling the truth; the gardener and the handyman are not both lying; and if the handyman is telling the truth then the cook is lying. For each of the four witnesses, can the detective determine whether that person is telling the truth or lying? Explain your reasoning.