CSE-103

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Subject: Assignment from Book.

Chapter no.:1

Section no.:2

Exercise no.: 35

35. 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.

SOLUTION:

Let's use the letters **B, C**, **G**, and **H** for the statements that the butler, cook, gardner, and handyman are telling the truth, respectively. We can then write each fact as a true proposition: **B -> C**; **negation(C^G)**; **(negation)((negation)G ^ (negation)H)**;And **H ->(negation)C**. Suppose that **B** is true. Then it follows from the first of our propositions that **C** must also be true. This tells us (using the second proposition) that **G** must be false, whence the third proposition makes **H** true. But now the fourth proposition is violated. Therefore we conclude that **B** cannot be true. If fact, the argument we have just given also proves that **C** cannot be true. Therefore we know that the butler and the cook are lying. This much already makes the first, second, and fourth propositions true, regardless of the truth of **G** or **H**. Thus either the gardner or the handyman could be lying or telling the truth; all we know (from the third proposition) is that at least one of them is telling the truth.