Proofs - CS 1050 B Spring 2003

Bonus Problems

Due **March 12, 2003**

1. (2pts.) You take a spoon of wine from a barrel of wine, and you put it into your cup of tea. Then you return a spoon of the nonuniform mixture from your cup to the barrel. Now you have some foreign substance (wine) in the cup and some foreign substance (tea) in the barrel. Which is larger: the quantity of wine in the cup or the quantity of tea in the barrel, at the end of your manipulations? (Assume no chemical reaction is taken place between the two substances.) Explain your answer.

2. (2pts.) Two old friends, A and B, meet on a downtown street. They have not seen each other for many years. A reveals that he has now 3 children. –'What is their age?' – asks B. A decides not to answer straight but in form of a puzzle: –'If one multiplies their ages, the result is 36.' –'That is not enough information to guess' – responds B. A continues: –'If one adds their ages, the sum equals the number of windows in this building across the street'. –'I still do not know' – says B. A then gives the final tip: –'The oldest child is a boy.' –'Now I know!' – announces B. Assuming that all 3 ages are integers, what is the age of each child of A ?

3. (3pts.) Having only a balance scale available, design a procedure which always finds a false coin (lighter or heavier than the good ones, this is not known), among 13 identically looking coins, in only 3 comparisons, i.e. the scale is used only 3 times. (We assume that among 13 coins 12 are good and exactly one is false.)