

## Home Work 5

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KT 1.1)

False: Counter Example: if  $m_1$  likes  $w_1$  most and  $m_2$  likes  $w_2$  most,  $w_1$  likes  $m_2$  most, and  $w_2$  likes  $m_1$  most. In GS-Stable matching  $m_1 \rightarrow w_1$  and  $m_2 \rightarrow w_2$ . Therefore, no woman will get her first choice.

KT 1.2)

True: Because  $w$  is first on  $m$ 's list, he will propose to her first. This leads to two situations: Either she is single in which case she says yes and will never accept any other match because she got her first choice. Or, she was matched, but dumps her current boyfriend for  $m$  because he is higher on the list. In both cases  $m$  and  $w$  end up together and there is no other person who could get them to switch.

KT 1.3)

It is not always possible. Counter example. Let  $S$  = shows with ratings 2,4. And  $T$  = shows with ratings 1,3. If the matchup is 2-1, and 4-3 then  $A$  wins two time slots. If  $B$  switches it slots, then the matchup is 2-3 and 4-1. Thus,  $A$  and  $B$  both win one. These are the only two sets of combinations. (There are really four total options, but 2-1, 4-3 is the same as 4-3,2-1 and so too with 2-3,4-1 and 4-1,2-3 thus there are effectively two options). However,  $A$  can then switch its schedule and get back two wins. Thus, there is no stable match.

4) This fundamental difference is that we don't have **two distinct groups** (such as men and women), and therefore no bipartite matching. In this case everyone would be proposing to everyone else at the same time.