

Tutorial 1

1. Decide whether you think the following statement is true or false. If it is true, give a short explanation. If it is false, give a counterexample.

Statement: Consider an instance of the Stable Matching Problem in which there exists a man m and a woman w such that m is ranked first on the preference list of w and w is ranked first on the preference list of m . Then in every stable matching S for this instance, the pair (m, w) belongs to S .

2. Let $M = m_1, m_2, m_3$ and $W = w_1, w_2, w_3$. Suppose that you are given the following preference lists:

$m_1: \langle w_3, w_2, w_1 \rangle; m_2: \langle w_2, w_3, w_1 \rangle; m_3: \langle w_2, w_3, w_1 \rangle;$

$w_1: \langle m_3, m_1, m_2 \rangle; w_2: \langle m_1, m_3, m_2 \rangle; w_3: \langle m_3, m_1, m_2 \rangle;$

- 1) Give a stable perfect matching, and an unstable perfect matching.
- 2) Find the best valid partner for each member of sets M and W .

3. List the following functions according to their order of growth from the lowest to the highest. (Hint: you could start with using basic asymptotic efficiency classes)

$$f_1(n) = n^{2.5}; \quad f_2(n) = \sqrt{2n}; \quad f_3(n) = n + 10$$
$$f_4(n) = 10^n; \quad f_5(n) = 100^n; \quad f_6(n) = n^2 \log n$$