

Crib 3

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Wednesday, September 7, 2016

The crib sheet contains cheat-sheet worthy information but is not a substitute for lectures or for reading the notes. It also contains pointers and common mistakes.

1 Definitions

- An **instance** of stable marriage is a set of preference lists.
- A **matching** for stable marriage is a specific set of (M_i, W_i) couples.
- A **rogue couple** is where (M, W) prefer each other to their current partners.
- A **stable** matching is one in which there are no rogue couples.
- The Traditional Marriage Algorithm (TMA) is where the men propose to the women. This algorithm is guaranteed to terminate and yield a male-optimal, female-pessimal, stable matching.

2 Key Ideas

- *Women Improvement Lemma*: The man a woman has on a string can only get better.
- *Male Optimality*: In TMA, the men receive their highest preference of all stable matchings. Note that SMA is optimal for the side that proposes.
- In general, consider proofs by induction or contradiction with SMA proofs. In most SMA proofs by contradiction, use the well-ordering principle ("The first day that ...") and construct a rogue couple.
- A common counter-example is the 2x2 case, where there are two men and two women, where all preference lists are different.