Homework 1: Q3

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# **Part (a) Proof Idea**

Just proving the lemma as essentially broken down to in recitation notes.

If you match one group with their preferences in a specific column ii, then the other group is matched with their preferences in column n−i+1.

mk is some man, and wj is some woman, n is the number of men and women. If we can prove the lemma with a generalized form, we can say that it is always true.

Through investigation, given some column im, mk is matched with wk+i-1 or if k+i-1 > n, it is matched with wk+i-1-n. Also, given some column iw, wj is matched with mj+i or if k+i > n, it is matched with mk+i-n.

Given some column i, man mk gets matched with wk+i-1 (lets disregard the intricacy of > n for now as it will pertain to specific input).

To prove the lemma, we have to prove that wk+i-1 ‘s n-i+1 column contains mk.

For clarity and use of the formula I have given previously, j = k+i-1, iw = n-i+1.

Again, given some column iw, wj is matched with wj+i or if k+i > n, it is matched with wk+i-n.

wj’s iwth column contains mj+I (i here is iw), which,

j+i = k+i-1+n-i+1 = k+n, which is clearly greater than n so we actually use the other formula saying to minus n so k+n -n = k

Thus, the woman in mk’s ith column has mk in her n-i+1 column.

To connect with the rest of the proof idea, given this stable matching family containing specific stable matching instances of this type, there are at least n stable matchings. Each group matches with the other group’s n-i+1

1. **Part (b) Proof Idea**
2. **Part (b) Proof Details**