Sep 15

Lemma 3: If at the end of an iteration, $\exists$ a free woman w then w has NOT proposed to ALL men.

Pigeon hole: If $\leq n-1$ pigeons are placed in n holes $\Rightarrow$ $\exists$ an empty hole.

Pf (idea) of Lemma 3 Pf by contradiction (use Obs 1, PHP, Algo def).

Pf (details): Assume $\exists$ a free woman w who has proposed to all men

$\Rightarrow$ all men have received ≥ 1 proposal

$\Rightarrow$ all n men are engaged —— (*)

Algo def + Obs 1

Since w is free $\Rightarrow$ $\leq n-1$ women are engaged.

≥ 1 man who is free

PHP
hole: man
pigeon: woman

$\Rightarrow$ $\leq n-1$ men are engaged

$\Rightarrow$ contradicts (*) ∎

Case 2.2: when m rejected w' proposal (m, w'' were engaged)

$w'' > w'$ in L_m

$w > w''$ in L_m (by Obs 1)

$\Rightarrow w > w'$ in L_m contradiction since we assum $w' > w$ in L_m