CMPS 102 — Fall 2018 – Homework 1
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I have read and agree to the collaboration policy.
Collaborators: none

Solution to Problem 1

To disprove that for any set of preference lists, Alice cannot end up with David by lying about Ben and Carl, consider the following preferences:

Men	Preference 1	Preference 2	Preference 3
David	Cindy	Alice	Jane
Ben	Alice	Cindy	Jane
Carl	Alice	Jane	Cindy

Women	Preference 1	Preference 2	Preference 3
Alice	David	Ben	Carl
Jane	Ben	Carl	David
Cindy	Carl	Ben	David

Claim 1. *Gale Shapely without lying will result in Alice being matched with someone other than David.*

Proof. Following Gale Shapely, we see the following events:
- David proposes to Cindy, Cindy accepts.
- Ben proposes to Alice, Alice accepts.
- Carl proposes to Alice, Alice declines.
- Carl proposes to Jane, Jane accepts.
- Terminate.
Couples are as follows:
David and Cindy
Ben and Alice
Carl and Jane ☐

Claim 2. *When Alice lies and says she prefers Carl over Ben, she gets paired with David.*

Proof. Following Gale Shapely with the new preference list, we see the following events:
- David proposes to Cindy, Cindy accepts.
- Ben proposes to Alice, Alice accepts.
- Carl proposes to Alice, Alice accepts.
- Ben proposes to Cindy, Cindy accepts.
- David proposes to Alice, Alice accepts.
- Carl proposes to Jane, Jane accepts
- Terminate.
Couples are as follows:
David and Alice
Ben and Cindy
Carl and Jane ☐

As we can see, the results are different and Alice did indeed benefit by lying about her preferences.