Comments on draft of project entitled "Infinite Symmetric Groups" by Luke Elliott

March 1, 2018

General comments

1. Generally looks really good, but it requires some polishing. The indroduction could use some polish. In particular, you might want to consider splitting it into two separate sections, one which is an introduction ("Here are all of the amazing and interesting things I will write about in my project") and a mathematical preliminaries section ("Here are lots of gorey details"). Maybe even into three sections, where the gorey details are delineated according to whether they are about background notions, or specific to the symmetric group.

2. You should add a paragraph beginning *"This project is organised as follows."*

3. I suggest including the key definitions required from groups, semigroups, and topology, without going into a great deal of detail.

4. At present you always introduce a notion just before you first use it (more or less anyway). It would be better to collect all related material together into coherent sections about those topics.

5. You should more clearly indicate what is your own work (i.e. original proof), and what is your own retelling of something you read somewhere.

6. In your notation for fix, supp, Pstab, these words should not appear in italics in the same way that Sym does not.

7. Sentence should always end with a full stop, even if they end in a displayed equation.

8. I personally don't like the use of the symbol $\Rightarrow$ as a substitute for words.

9. Some of the proofs perhaps are a little long, such as that of Theorem 2.1.3 (isn't there an easier less technical way of doing this?), a picture of the proof of Theorem 3.1.3 would be good, and in several places a sentence explaining the general idea of the proof would also be helpful.

10. Overall, I'd recommend trying to improve what you have already written, rather than adding further material, at this point. You could write a bit more about what you might have written about next if would have continued studying the infinite symmetric groups, or similar groups.

Specific comments

1. p1: *"Indroduction"*

2. p1, line 2: *"any group can be embedded into any symmetric group"* So, the symmetric group on the naturals can be embedded into the trivial group?

3. p5, Theorem 1.0.14: you might want to comment on how Pstab and Sstab relate to one another. It is common to denote the by $G_{(S)}$ and $G_{\{S\}}$ respectively in the literature, you might consider doing this too.

4. p6: *"the notation $(a_0, a_1, a_2 \ldots, a_n)$ to denote a cycle which maps..."* shouldn't this be $(a_0, a_1, \ldots, a_{n-1})$? (Also note the missing commas.

5. p6, Proof of Theorem 2.1.3: *"i-cycles"* should be *i-cycles* and the subscripts are messed up in the first line here too.

6. p18, Theorem 3.2.3: *"there exists cofinal and strong"* should be *"there exist cofinal and strong"*.

7. p33: there are letters missing from several of the author's names in the bibiliography. Several of the references are actually not referenced in the text [2] for instance.

8. There are certainly more typos, please find them, and fix them too.