1. In May’s Theorem, we always assume a PAR is anonymous, neutral, and positively responsive. Characterize the class of PAR’s that result upon dropping the neutrality axiom.

2. Complete A-SkB, #2.4 (Sen’s impossibility of a Paretian liberal). Interpret this result.

3. The Borda score for an individual agent is a utility representation of her preference. We know that any strictly increasing transformation of a utility representation for an individual obtains another, equally valid utility representation.

   a) Construct a society and preference profile $\theta$. Show that $b_i(\cdot, \theta)$ is a utility representation for $R_i(\theta)$.

   b) Next, $\sum_{i \in N} b_i(\cdot, \theta)$ gives a utility representation for the social preference given by Borda’s rule. For all $i$, let $\gamma_i : \mathbb{R} \to \mathbb{R}$ be a strictly increasing function. Show that $\sum_{i \in N} \gamma_i(b_i(\cdot, \theta))$ does not necessarily represent the social preference given by Borda’s rule. This shows us that adding preference representations can rank alternatives differently depending on which representations we use. (also read Arrow, p. 31-33)

   c) Does b) mean that utility is comparable across agents? (i.e. Is there any meaning to statements of the form: “Agent $i$ is “as well off as agent $j$ with alternative $x$.”)