1156-20-163 **Ignat Soroko** (ignat.soroko@gmail.com). *Ranks of joins and intersections in free groups.*

The famous Hanna Neumann Conjecture (now the Friedman–Mineyev Theorem) stipulates that for the ranks of arbitrary subgroups H and K of a nonabelian free group we have:

$$\operatorname{rank} H \cap K - 1 \leq (\operatorname{rank} H - 1)(\operatorname{rank} K - 1).$$

It is an interesting open question to quantify this bound with respect to the rank of $H \vee K$, the subgroup generated by H and K. We describe a set of realizable values $(\operatorname{rank} H \vee K, \operatorname{rank} H \cap K)$ for arbitrary H, K, and conjecture that this locus is complete. Using the approach developed by Dicks in the context of his Amalgamated Graph Conjecture, we prove that the locus is complete when $\operatorname{rank} H = 2$ and show that the region

$$\operatorname{rank} H \vee K \geq \operatorname{rank} H + \operatorname{rank} K - 3 \quad \& \quad \operatorname{rank} H \cap K \geq 4$$

consists of non-realizable values, thus resolving the remaining open case of R. Guzman's conjecture in the affirmative and obtaining applications to 3-dimensional topology. (Received January 28, 2020)