

# Conjectures concerning the orders of the torsion subgroup, the arithmetic component groups, and the cuspidal subgroup

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$\text{III}_E$  = Shafarevich-Tate group of  $E$



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Can prove some partial results towards this conjecture, using Ribet's level lowering theorem.



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## Theorem

*If  $N$  is square-free and  $r$  is a prime that does not divide  $6N$ , but divides  $|E(\mathbf{Q})_{\text{tor}}|$ , then  $r$  divides  $|C|$ .*

Question: Do the conjectures above generalize to arbitrary abelian subvarieties of  $J_0(N)$  associated to modular forms?