Possible Project 2

The aim is understand some traditional numerical PDE algorithm. We want to investigate whether the vortex method works for 3D axisymmetric Euler equations without swirl. Basically, there are several things need to be considered

- Make a survey of the point vortex method (it is a Hamiltonian system) and possibly a survey of symplectic geometric algorithms for Hamiltonian systems. One reference could be "Convergence of point vortex method for 2-D vortex sheet" by J. Liu and Z. Xin.
- Summarize the proof for the convergence of the vortex method (not point vortex method) (for general vortex data, not necessarily point vortex) in "Convergence of a Galerkin Methodfor 2-D Discontinuous Euler Flows" by Jian-Guo Liu and Zhouping Xin
- Explore whether we have point vortex method and vortex method for 3D axisymmetric Euler equations without swirl. (Check the work "On Vorticity Gradient Growth for the Axisymmetric 3D Euler Equations Without Swirl" by Tam Do; and the paper "Characterization and Regularity for Axisymmetric Solenoidal Vector Fields with Application to Navier-Stokes Equation" by J. Liu et al), and related references.) This problem may be difficult due to the singularity at r = 0