

1040-76-192

Marco Sammartino* (marco@math.unipa.it), Via Archirafi 34, 90123 Palermo, Italy, and
Maria Carmela Lombardo (lombardo@math.unipa.it), Via Archirafi 34, 90123 Palermo, Italy.
Singularity Formation and Separation Phenomena in Boundary Layer Theory. Preliminary report.

In this talk we shall give a short review of some recent results in the study of the behavior of a high Reynolds number fluid which has developed an internal scale due to the interaction with a physical boundary. In this case one can derive Prandtl's equations as a formal asymptotic limit of the Navier-Stokes equations. Our aim is to review some known short time results for Prandtl's equations and investigate the process leading to the formation of a singularity in the solution. Moreover we shall show some numerical evidence of the ill posedness of Prandtl's equation in H^1 : in fact the presence of two counter-rotating vortices inside the boundary layer seems to produce a blow-up of the solution in an arbitrary short time.

We shall also treat the case of a planar inviscid flow with initial datum of vortex layer-type. The vorticity is therefore concentrated in a layer whose thickness is of the order the square root of the viscosity. After a brief review on some of the results appeared in the last three decades, we consider the role of the viscosity and derive the vortex layer equations. Assuming the initial as well the matching (with the outer flow) data to be analytic, we shall prove that the model equations are well posed. (Received February 14, 2008)