Bifurcation of Longitudinal Vortical Flows in the Plane Poiseuille Flow by the Ghost Effect of Infinitesimal Curvature TOSHIYUKI DOI, Tottori University, YOSHIO SONE, (P. Emeritus Kyoto University) — Flows of a viscous incompressible fluid between two parallel plates for infinite Reynolds number are studied as the limiting behavior of flows between two coaxial circular cylinders as the radius of the inner cylinder and the Reynolds number tend to infinity simultaneously with the difference of the radii of the two cylinders fixed. When the speed of divergence of the radius is not faster than the order of the Reynolds number squared, the infinitesimal curvature of the plates produces a finite effect on the flow. Owing to this effect, a longitudinal vortical flow is found to bifurcate from the plane Poiseuille flow of a parabolic velocity profile at infinite Reynolds number. The limiting relation between the radius and the Reynolds number that determines the bifurcation point is derived, and the bifurcated flow fields away from the bifurcation point are obtained numerically.

Toshiyuki Doi
Tottori University