

The Hele-Shaw problem with surface tension in a half plane, *Journal of Differential Equations*, 216 (2005), 439-469. (A. Friedman).

Abstract

In this paper, we consider the Hele-Shaw problem in a 2-dimensional fluid domain $\Omega(t)$ which is constrained to a half-plane. The boundary of $\Omega(t)$ consists of two components: $\Gamma_0(t)$ which lies on the boundary of the half-plane, and $\Gamma(t)$ which lies inside the half-plane. On $\Gamma(t)$ we impose the classical boundary conditions with surface tension, and on $\Gamma_0(t)$ we prescribe the normal derivative of the fluid pressure. At the point where $\Gamma_0(t)$ and $\Gamma(t)$ meet, there is an abrupt change in the boundary condition giving rise to a singularity in the fluid pressure. We prove that the problem has a unique solution with the smooth free boundary $\Gamma(t)$ for some small time interval.