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*Uniqueness and non-uniqueness of solutions to the floating ball problem*

Consider a ball of density $\rho$ floating at the interface of a fluid of density $\rho_\ell$. The dominant forces are due to surface tension and gravity. A variational argument gives the usual necessary conditions of the Young-Laplace equation with Neumann type boundary conditions, however, there is a new additional condition on the free boundary. We explore this condition and illustrate how it leads to uniqueness or non-uniqueness.