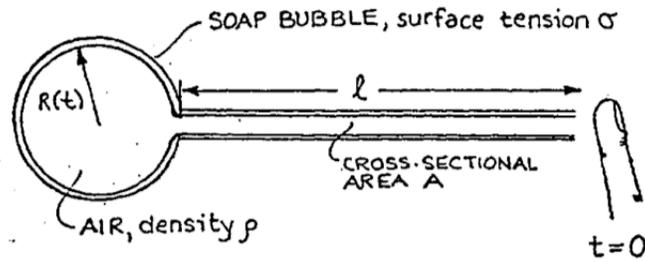


MIT Department of Mechanical Engineering
2.25 Advanced Fluid Mechanics

Problem 4.12

This problem is from "Advanced Fluid Mechanics Problems" by A.H. Shapiro and A.A. Sonin



A soap bubble (surface tension σ) is attached to a narrow glass tube of the dimensions shown. The initial radius of the bubble is R_0 . At $t = 0$, the end of the tube is abruptly opened.

- Obtain a solution for $R(t)$, assuming that the flow is : (i) incompressible and (ii) inviscid, that (iii) gravitational effects are negligible, and that (iv) the temporal acceleration term in Euler's equation is negligible (we are referring to the term involving the partial derivative of the velocity with time).
- Derive a criterion for when assumption (iv) is satisfied.

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