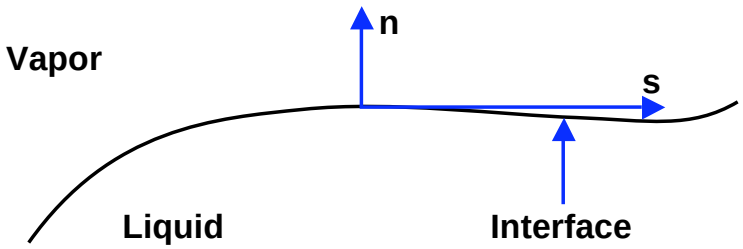
Problem 147A

Consider a planar, steady two phase flow in which there is an interface between the liquid phase (denoted by the subscript L) and the vapor phase (denoted by the subscript V). The densities of the two phases, ρ_L and ρ_V, can be considered known, constant and uniform. Since the flow is steady the position of this interface is fixed in the frame of reference in which we are observing it. However, since evaporation or condensation is occuring the velocity components normal to the interface are not zero.

For convenience we select a coordinate system at some arbitrary point on this interface such that the coordinate, n, is normal to the interface and the coordinate, s, is tangential to the interface:



Determine:

1. The kinematic boundary condition on the components of the velocities normal to the interface in the liquid and vapor phases, u_{Ln} and u_{Vn}.
2. The kinematic boundary condition on the components of the velocities tangential to the interface in the liquid and vapor phases, u_{Ls} and u_{Vs}.
3. The dynamic boundary condition on the shear stresses in the liquid and vapor phases, σ_{Lsn} and σ_{Vsn}.
4. The dynamic boundary condition on the normal stresses in the liquid and vapor phases, σ_{Lnn} and σ_{Vnn}.