Problem 109C

A body with a typical length, L, is dragged through a viscous fluid (viscosity, μ, and density, ρ) at a velocity, U. By utilizing only the known dimensions of these quantities (in terms of kg, m and s if you wish) construct two groupings of these quantities which have the units of force. One should contain μ but not ρ; the second should include ρ but not μ.

It could then be argued that the force required to drag the body through the fluid should be related to these two "typical forces". The one which includes μ is a viscous force (F_v) and the other is an inertial force (F_i). Identify the parameter which we can use to determine the conditions under which either F_v or F_i are dominant.