

Problem 2C.3

Velocity distribution in a tube. You have received a manuscript to referee for a technical journal. The paper deals with heat transfer in tube flow. The authors state that, because they are concerned with nonisothermal flow, they must have a “general” expression for the velocity distribution, one that can be used even when the viscosity of the fluid is a function of temperature (and hence position). The authors state that a “general expression for the velocity distribution for flow in a tube” is

$$\frac{v_z}{\langle v_z \rangle} = \frac{\int_y^1 (\bar{y}/\mu) d\bar{y}}{\int_0^1 (\bar{y}^3/\mu) d\bar{y}} \quad (2C.3-1)$$

in which $y = r/R$. The authors give no derivation, nor do they give a literature citation. As the referee you feel obliged to derive the formula and list any restrictions implied.