

2-14. For laminar flow in the entrance to a pipe, as shown in Fig. P2-14, the entrance flow is uniform,  $u = U_0$ , and the flow downstream is parabolic in profile,  $u(r) = C(r_0^2 - r^2)$ . Using the integral relations of Sec. 2-13, show that the viscous drag exerted on the pipe walls between 0 and  $x$  is given by

$$\text{Drag} = \pi r_0^2 \left( p_0 - p_x - \frac{1}{3} \rho U_0^2 \right)$$

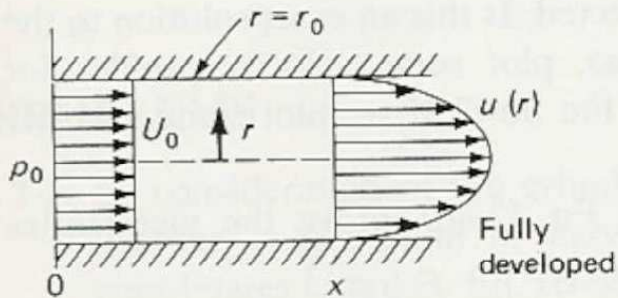


FIGURE P2-14