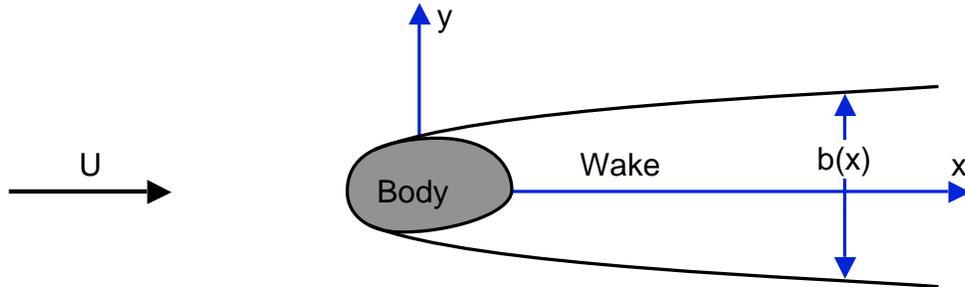


**Problem 222B**

Wake surveys are made in the two-dimensional wake behind a body (cylindrical) which is externally supported in a uniform stream of incompressible fluid approaching the cylinder with velocity,  $U$ :



The surveys are made at  $x$  locations sufficiently far downstream of the body so that the pressure across the wake is the same as the ambient pressure in the fluid far from the body. They indicate that, to a first approximation, the velocity defect in the wake (the amount by which the velocity,  $u$ , is less than  $U$ ) varies with lateral position,  $y$ , according to

$$u = U - A(x) \cos \pi y/b(x) \quad \text{for} \quad -\frac{b}{2} < y < +\frac{b}{2}$$

where  $A(x)$  and  $b(x)$  are the centerline velocity defect and wake width respectively both of which vary with position,  $x$ . If the drag on the body per unit distance normal to the plane of the sketch is denoted by  $D$  and the density of the fluid by  $\rho$  find the relation for  $b(x)$  in terms of  $A(x)$ ,  $U$ ,  $\rho$  and  $D$ .