

9.13

9.13 A viscous fluid flows past a flat plate such that the boundary layer thickness at a distance 1.3 m from the leading edge is 12 mm. Determine the boundary layer thickness at distances of 0.20, 2.0, and 20 m from the leading edge. Assume laminar flow.

For laminar flow $\delta = C\sqrt{x}$, where C is a constant.

Thus,

$$C = \frac{\delta}{\sqrt{x}} = \frac{12 \times 10^{-3} \text{ m}}{\sqrt{1.3 \text{ m}}} = 0.0105 \quad \text{or} \quad \delta = 0.0105 \sqrt{x} \quad \text{where } x \sim \text{m}, \delta \sim \text{m}$$

$x, \text{ m}$	$\delta, \text{ m}$	$\delta, \text{ mm}$
0.2	0.00470	4.70
2.0	0.0148	14.8
20.0	0.0470	47.0