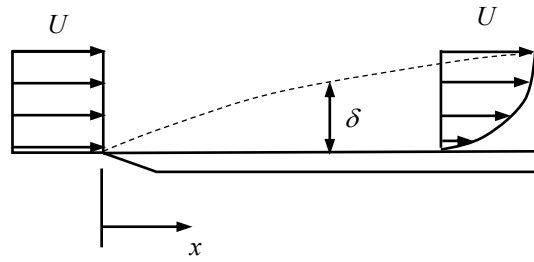


Boundary Layers – Laminar Boundary Layers



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From the Blasius (exact) solution for **laminar boundary layer flow over a flat plate (with no pressure gradient)**:



$$\frac{\delta}{x} = \frac{5.0}{\text{Re}_x^{1/2}} \quad \frac{\delta_D}{x} = \frac{1.72}{\text{Re}_x^{1/2}} \quad \frac{\delta_M}{x} = \frac{0.664}{\text{Re}_x^{1/2}}$$

(assuming unit width into the page)

$$c_f \equiv \frac{\tau_w}{\frac{1}{2}\rho U^2} = \frac{0.664}{\text{Re}_x^{1/2}} \quad c_D \equiv \frac{D}{\frac{1}{2}\rho U^2 L(1)} = \frac{\int_{x=0}^{x=L} \tau_w dx(1)}{\frac{1}{2}\rho U^2 L(1)} = \frac{1.328}{\text{Re}_L^{1/2}}$$

$$\text{Re}_x < 500,000 \quad \text{Re}_x = \frac{Ux}{\nu} \quad \text{Re}_L = \frac{UL}{\nu}$$

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