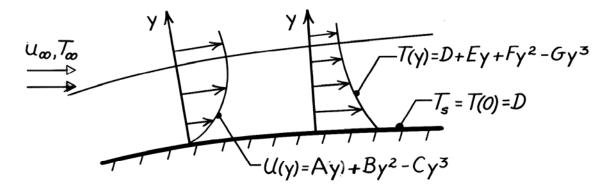
## PROBLEM 6.1

**KNOWN:** Form of the velocity and temperature profiles for flow over a surface.

**FIND:** Expressions for the friction and convection coefficients.

## **SCHEMATIC:**



**ANALYSIS:** The shear stress at the wall is

$$\tau_{s} = \mu \frac{\partial u}{\partial y}\Big]_{y=0} = \mu \left[A + 2By - 3Cy^{2}\right]_{y=0} = A\mu.$$

Hence, the friction coefficient has the form,

$$C_{f} = \frac{\tau_{s}}{\rho u_{\infty}^{2}/2} = \frac{2A\mu}{\rho u_{\infty}^{2}}$$

$$C_{f} = \frac{2A\nu}{u_{\infty}^{2}}.$$

The convection coefficient is

$$h = \frac{-k_f \left(\partial T/\partial y\right)_{y=0}}{T_s - T_{\infty}} = \frac{-k_f \left[E + 2Fy - 3Gy^2\right]_{y=0}}{D - T_{\infty}}$$

$$h = \frac{-k_f E}{D - T_{\infty}}.$$

**COMMENTS:** It is a simple matter to obtain the important surface parameters from knowledge of the corresponding boundary layer profiles. However, it is rarely a simple matter to determine the form of the profile.

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