3.11

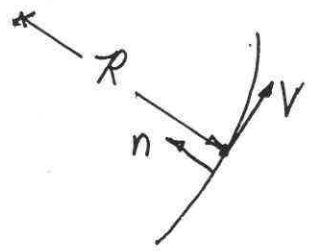
3.11 Air flows along a horizontal, curved streamline with a 20 ft radius with a speed of 100 ft/s. Determine the pressure gradient normal to the streamline.

$-\gamma \frac{dz}{dn} - \frac{\partial p}{\partial n} = \frac{\rho V^2}{R}$, where $\frac{dz}{dn} = 0$ since the streamine is horizontal.

Thus,

$$\frac{\partial p}{\partial n} = -\frac{\rho V^2}{R} = \frac{-(0.00238 \frac{slug}{ft^3})(100 \frac{ft}{s})^2}{20 ft}$$

$$= -1.19 \frac{slug}{ft^2 \cdot s^2}\left(1 \frac{lb}{\left(\frac{slug \cdot ft}{s^2}\right)}\right) = \underline{\underline{-1.19 \frac{lb}{ft^3}}}$$



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