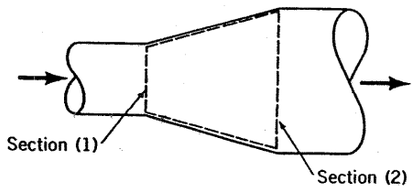
5.1

5.1 Water enters a conical diffusing passage (see Fig. P5.1) with an average velocity of 10 ft/s. If the entrance cross section area is 1 ft^2, how large should the diffuser exit area be to reduce the average velocity level to 1 ft/s?



V_1 = 10 ft/s V_2 = 1 ft/s
A_1 = 1 ft^2

FIGURE P5.1

For steady incompressible flow between sections (1) and (2)

$$Q_1 = Q_2$$

or

$$A_1 \bar{V}_1 = A_2 \bar{V}_2$$

So

$$A_2 = A_1 \frac{\bar{V}_1}{\bar{V}_2} = (1\ ft^2)\frac{(10\ \frac{ft}{s})}{(1\ \frac{ft}{s})}$$

$$A_2 = 10\ ft^2$$