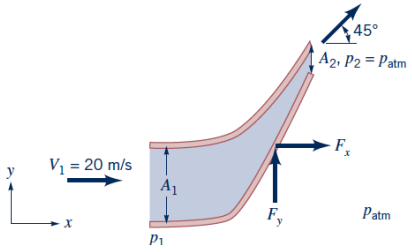
ME 3710
Homework 6
Due Thursday February 29 at 11:59pm – upload to Canvas
[5 problems – 15 pts]

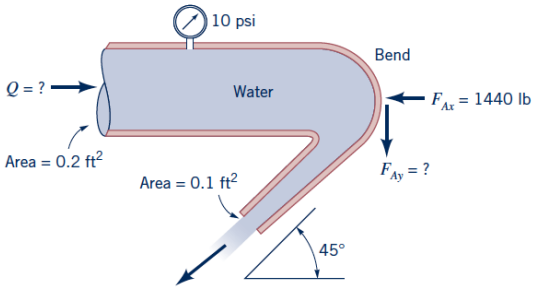
Problem 5.37

Find the horizontal and vertical forces to hold stationary, the nozzle as shown in the figure below. The fluid flowing through it is 10 °C liquid water; $A_1 = 1.0\,\text{m}^2, A_2 = 0.25\,\text{m}^2, V_1 = 20\frac{\text{m}}{\text{s}}$, $p_2 = p_{atm}$ and $p_1 = p_{atm} + 30\,\text{kPa}$. Neglect gravity.



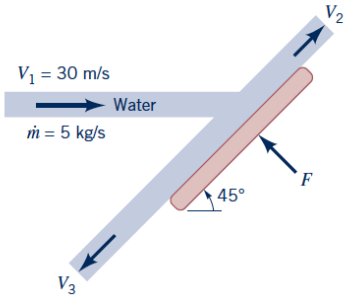
Problem 5.38

Water flows through a horizontal bend and discharges into the atmosphere as shown in the figure below. When the pressure gage reads 10 psi, the resultant x-direction anchoring force, F_{Ax}, in the horizontal plane required to hold the bend in place is shown on the figure. Determine the flowrate through the bend and the y-direction anchoring force, F_{Ay}, required to hold the bend in place. The flow is not frictionless.



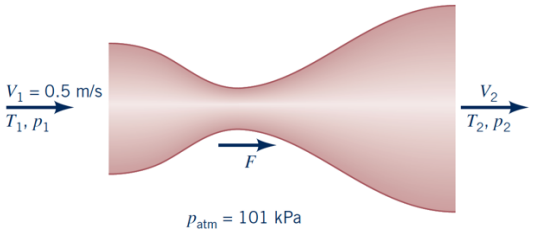
Problem 5.39

Find the magnitude of the force F required to hold the plate in the figure below stationary.



Problem 5.43

Air at $T_1 = 300\,\text{K}$, $p_1 = 303\,\text{kPa}$, and $V_1 = 0.5\,\text{m/s}$ enters the Venturi as shown in the figure below. The air leaves at $T_2 = 220\,\text{K}$ and $p_2 = 101\,\text{kPa}$; $A_1 = 0.6\,\text{m}^2$ and $A_2 = 1.0\,\text{m}^2$. Calculate the horizontal force required to hold the Venturi stationary.



Problem 5.50

A vertical jet of water leaves a nozzle at a speed of $10\,\text{m/s}$ and a diameter of $20\,\text{mm}$. It suspends a plate having a mass of $1.5\,\text{kg}$ as indicated in the figure below. What is the vertical distance h?