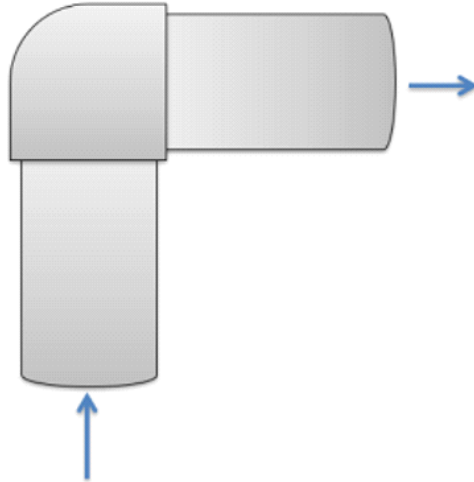


Problem 2

An 90 degree elbow joint redirects the flow along a 3 cm diameter pipe. If water (density=1000 kg/m³) is traveling through the pipe with an average speed of 5 m/s, what is the magnitude and direction of the force the water exerts on the elbow joint?



$$\dot{m} = \rho V A$$

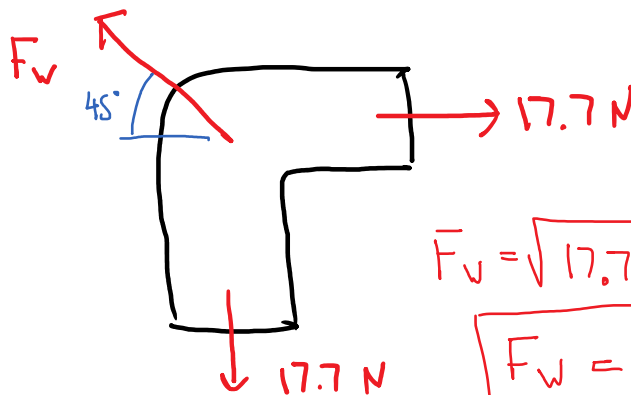
\uparrow \uparrow \leftarrow
 1000 $\frac{\text{kg}}{\text{m}^3}$ 5 $\frac{\text{m}}{\text{s}}$ $\pi (0.015 \text{ m})^2$

$$\dot{m} = 3.53 \text{ kg/s}$$

$$F_x = \dot{m} (V_{fx} - V_{ix}) = 17.7 \text{ N}$$

\uparrow
 5 $\frac{\text{m}}{\text{s}}$ 0

$$F_y = \dot{m} (V_{fy} - V_{iy}) = -17.7 \text{ N}$$



$$F_w = \sqrt{17.7^2 + (-17.7)^2}$$

$$F_w = 25.0 \text{ N}$$