Chapter 9 Homework 3

44) $d_1 = .0274\,m$

$V_1 = 25L \times \frac{1m^3}{1000L} = .025m^3$

$t_1 = 1.5min \times \frac{60sec}{1min} = 90sec$

A) Flow rate $= R = \frac{Vol}{time} = \frac{.025}{90} = 2.778\times10^{-4}$

$R = vA = v(\pi r^2) \Rightarrow 2.778\times10^{-4} = v(\pi(.0137^2))$

$\boxed{v = 0.471 m/s}$

47) $\rho = 1000\,kg/m^3$

$A_1 = 2.5\times10^{-5}m^2$

$P_1 = ? + 1\times10^5 Pa$

$F = 2\,N$

$v_2 = ?$

$P_2 = 1\times10^5 Pa$

$P_1 + \cancel{\rho g y_1} + \frac{1}{2}\rho v_1^2 = P_2 + \cancel{\rho g y_2} + \frac{1}{2}\rho v_2^2$

① $P_{gauge} = \frac{F}{A} = \frac{2}{2.5\times10^{-5}} = 80{,}000$ so actual $P_1 = 80{,}000 + 1\times10^5$

$P_1 = 180{,}000\,Pa$

② Because A_1 (barrel) is so much bigger than A_2 (needle), assume $v_1 \approx 0$

③ $P_1 = P_2 + \frac{1}{2}\rho v_2^2$