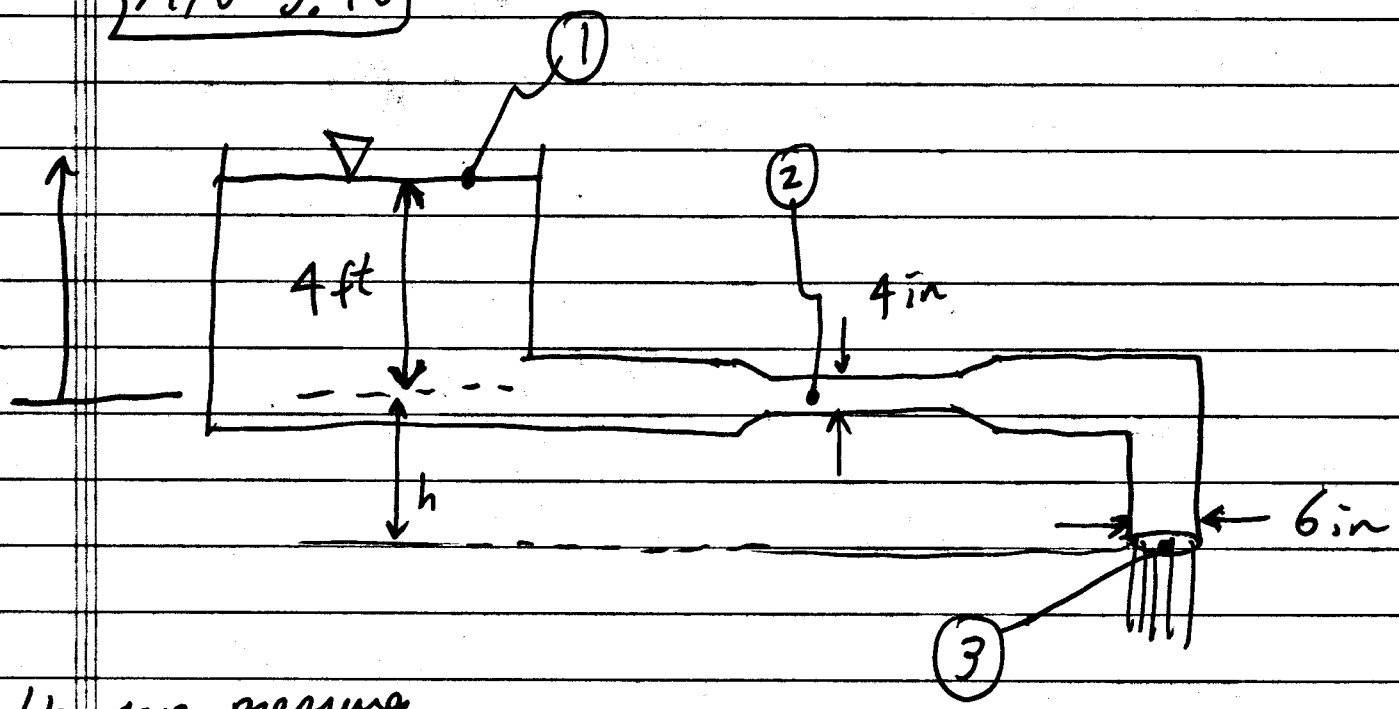
MYO 3.48



Use gage pressure

$p_2 = -10\ psi = -1440\ lb/ft^2$ ⟵ p at which tube collapses.

$p_1 = 0$

$p_3 = 0$

① → ② $p_1 + \frac{1}{2}\rho V_1^2 + \gamma z_1 = p_2 + \frac{1}{2}\rho V_2^2 + \gamma z_2$

$(62.4\ lb/ft^3)(4\ ft) = (-1440\ lb/ft^3) + \frac{1}{2}(1.94\ slugs/ft^3)\,V_2^2$

$V_2 = 41.7\ ft/s$

$A_2 V_2 = A_3 V_3 \qquad V_3 = \frac{A_2}{A_3} V_2 = \left(\frac{4}{6}\right)^2 (41.7\ ft/s)$

$V_3 = 18.5\ m/s$

② → ③ $p_2 + \frac{1}{2}\rho V_2^2 + \gamma z_2 = p_3 + \frac{1}{2}\rho V_3^2 + \gamma z_3$

$-1440\ lb/ft^2 + \frac{1}{2}(1.94\ slugs/ft^3)(41.7\ ft/s)^2 = \frac{1}{2}(1.94\ slugs/ft^3)(18.5\ m/s)^2 + (62.4\ lb/ft^3)(z_3)$