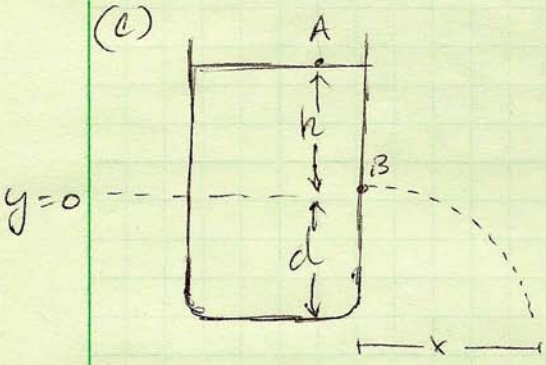
FLUIDS SAMPLE 3

2007 AP B # 4

(a) $V_f = \Delta Vol/time = \frac{7.2\times10^{-4}\,m^3}{(2\,min)(60\,sec/min)} = \underline{6\times10^{-6}\,\frac{m^3}{s} = V_f}$

(b) $V_f = V \cdot A \Rightarrow V = \frac{V_f}{A} = \frac{6\times10^{-6}\,m^3/s}{2.5\times10^{-6}\,m^2} = \underline{V = 2.4\,m/s}$

(c)



Using Bernoulli's Equation...

$\cancel{P_A} + \rho g y_A + \frac{1}{2}\cancel{\rho V_A^2}^{\,0} = \cancel{P_B}^{\,0} + \cancel{\rho g y_B}^{\,0} + \frac{1}{2}\rho V_B^2$

$P_A = P_B$, $V_A \approx 0$ $(A_A >> A_B)$

$y_A = h$; $y_B = 0$

so $\rightarrow$ $\cancel{\rho} g h = \frac{1}{2}\cancel{\rho} V_B^2 \Rightarrow h = \frac{V_B^2}{2g} = \frac{(2.4\,m/s)^2}{2\cdot 9.8\,m/s^2} = \underline{h = 0.29\,m}$

(d) if $h = h/2 \Rightarrow V^2 = 2gh$ $\therefore$ V^2 cut in half so V is $\frac{1}{\sqrt{2}} V_c$ since velocity is less, x will be less as water is in projectile motion after it leaves, so it will hit to the <u>left</u> of the cup.