Kurzlösungen zur Klausur „Strömungslehre“ vom 01.08.2002

Aufgabe 1:

a)
(1): $\rho_k < \rho_a$
(2): $\rho_k = \rho_a$
(3): $\rho_a < \rho_k < \rho_b$
(4): $\rho_k = \rho_b$
(5): $\rho_k > \rho_b$

b)
stabil: (1), (3), (5).
instabil: (2), (4).

Aufgabe 2:

$$A = \pi R^2 = \frac{\pi}{4} D^2 = \sqrt{\frac{8 \cdot \pi \cdot \dot{V} \cdot \nu}{g}}$$

Aufgabe 3:

$$l_1 = \frac{H^2}{2(H - h_1) B \sin\alpha} \left(l_2 - \frac{1}{3} \frac{H}{\sin\alpha} \right)$$

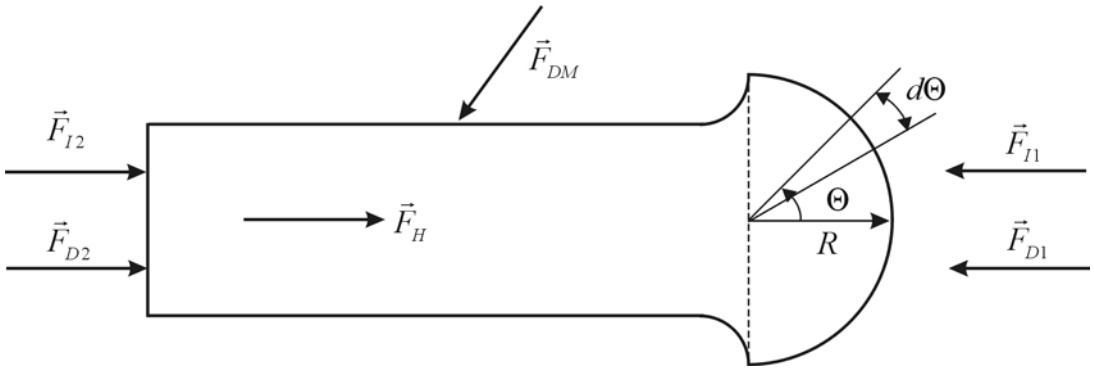
Aufgabe 4:

$$\dot{m} = \rho \; A_2 \sqrt{2 g \Delta h \left(\frac{\rho_{Hg}}{\rho} - 1 \right) \frac{1}{1 - (A_2 / A_1)^2}}$$

Aufgabe 5:

a)
$$c_2 = \sqrt{\frac{2(p_a - p_i)}{\rho}} \quad \Rightarrow \quad c_1 = \frac{h}{\pi R} \sqrt{\frac{2(p_a - p_i)}{\rho}}$$

$$\Rightarrow \quad p_1 = \left(1 - \frac{h^2}{\pi^2 R^2} \right) p_a + \frac{h^2}{\pi^2 R^2} p_i \quad \Rightarrow \quad \dot{V} = c_2 A_2 = b \cdot h \sqrt{\frac{2(p_a - p_i)}{\rho}}$$



b) $\left|\vec{F}_H\right| = hb\left(\frac{2h}{\pi^2 R} - 1\right)\left(p_a - p_i\right)$

Richtung: ←

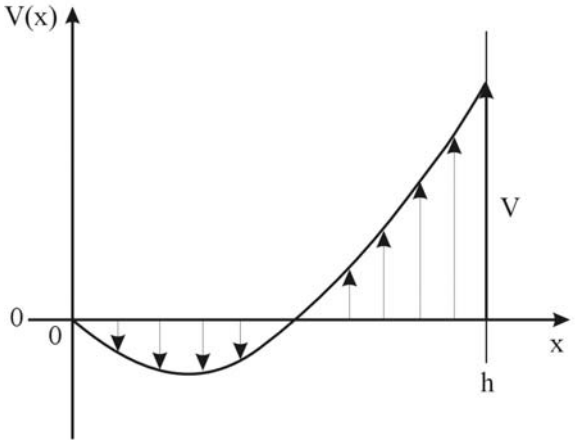
Aufgabe 6:

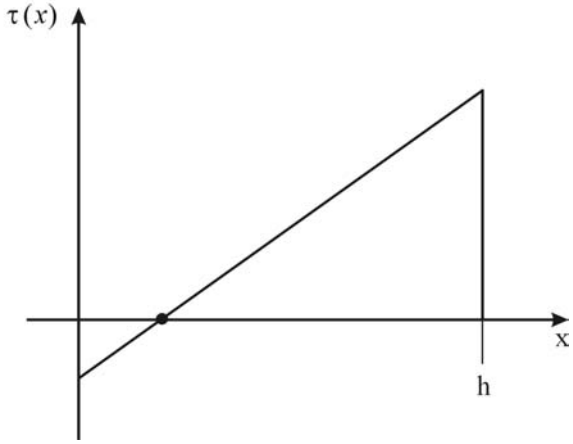
a) $\frac{\partial \tau}{\partial x} = \rho\, g$

b) $v(x=0) = 0 \quad , \quad v(x=h) = V$

c) $v(x) = \frac{g}{2\nu}\left(x^2 - hx\right) + \frac{V}{h}x$

$\tau(x) = \rho\ g\left(x - \frac{h}{2}\right) + \rho\ \nu\frac{V}{h}$





d) $V \geq \frac{gh^2}{2\nu}$

e) $\dot{V} = \int_0^h v(x)dx = \frac{1}{2}Vh - \frac{1}{12}\frac{gh^3}{\nu}$