

**CE 3305 Engineering Fluid Mechanics**  
**Exercise Set 7**  
**Summer 2018 – GERMANY**

**Purpose :** Apply Lagrangian and Eulerian concepts to determine point values of velocity and acceleration.

**Assessment Criteria :** Completion, plausible solutions, use **R** as a calculator.

**Exercises**

1. (Problem 4.6 pg 157) For a given hypothetical flow, the velocity from time  $t=0$  to  $t=5$  seconds was  $u = 2\text{m/s}$ ,  $v=0$ . Then from time  $t=5$  seconds to  $t=10$  seconds, the velocity was  $u = +3\text{ m/s}$ ,  $v=-4\text{m/s}$ . A dye streak was started at a point in the flow field at time  $t=0$ , and the path of a particle in the fluid was also traced from that same point starting at the same time. Draw to scale the streakline, path line of the particle, and streamlines at time  $t=10$  seconds.
2. (Problem 4.30 pg 159) Figure 1 is a schematic of a liquid flowing through a two-dimensional slot with a velocity of  $V = 2(q_0/b)(t/t_0)$ , where  $q_0$  and  $t_0$  are reference values. What is the local acceleration at  $x = 2B$  and  $y = 0$  in terms of  $B, t, t_0$ , and  $q_0$ ?

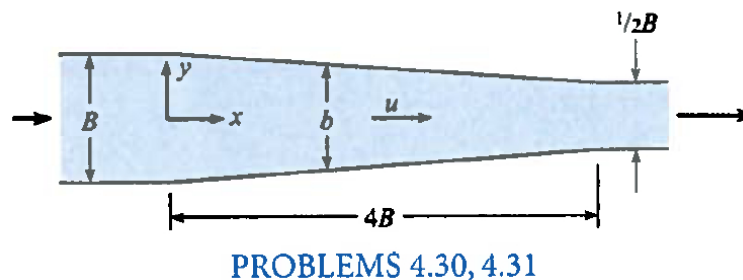


Figure 1: Converging wall flow field