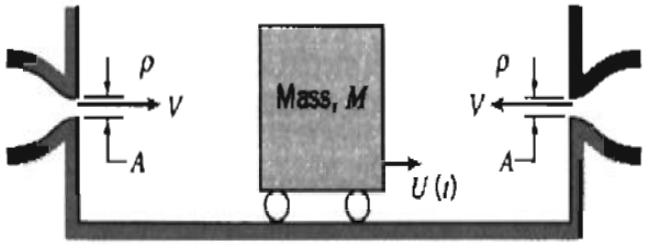
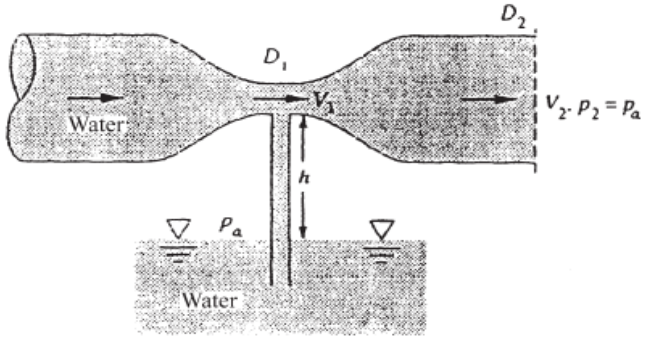
Fluid Mechanics and Rate Processes: Integral Formulation Tutorial; September 01, 2016

P1. A rectangular block of mass, M with vertical faces, rolls on a horizontal surface between two opposite jets as shown in Fig. P1. Assume that at t=0, when the block is at x=0, it is set into motion at speed U_0=10m/s, to the right. Calculate the time required to reduce the block speed to U=0.5m/s, and the block position at that instant.



P1

P2. A necked-down section in a pipe flow, called a venturi, develops a low throat pressure which can aspirate fluid upward from a reservoir, as in Fig. P2. Using Bernoulli's equation with no losses, derive an expression for the velocity V_1 which is just sufficient to bring reservoir fluid into the throat.



P2

P3. A pump draws water from a reservoir through a 150mm diameter suction pipe and delivers it to a 75 mm diameter discharge pipe. The end of the suction pipe is 2 m below the free surface of the reservoir. The pressure gage on the discharge pipe (2 m above the reservoir surface) reads 170 kPa. The average speed in the discharge pipe is 3m/s. If the pump efficiency is 75 percent, determine the power required to drive it.