

Assignment 3

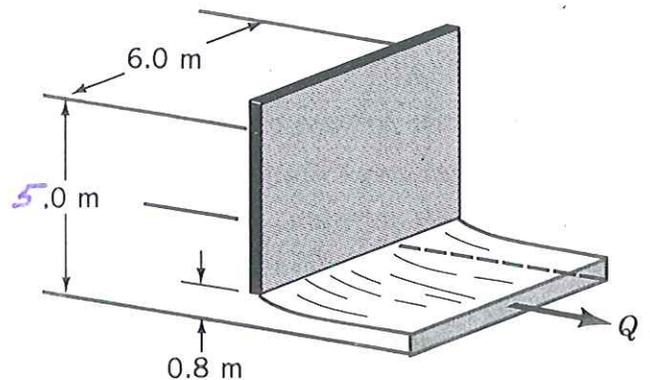
1. Find the streamlines and plot them for a flow velocity given by $\vec{v} = \frac{v_0}{l}(x, -y)$

2. Find the streamlines at times $t = 0$ and $t = \frac{\pi}{2\omega}$ for water ejected from an oscillating sprinkler head with flow velocity given by

$$\vec{v} = u_0 \sin \omega(t - y/v_0) \hat{x} + v_0 \hat{y}$$

Use the boundary condition $x = y = 0$.

3. Water flows under the sluice gate shown below. Determine the approximate flowrate per unit width of the channel.



4. A submarine moves through sea water (SG = 1.03) at a depth of 50 m with velocity 5 m/sec. Determine the pressure at the stagnation point which is at the front end nose of the submarine.
5. Water enters a rotating lawn sprinkler through its base at the steady rate of 1 l/sec as shown below. The exit area of each of the two nozzles is 30 mm^2 and the flow leaving each nozzle is in the tangential direction. The radius from the axis of rotation to the centerline of each nozzle is 200 mm. Determine the resisting torque required to hold the sprinkler head stationary.

