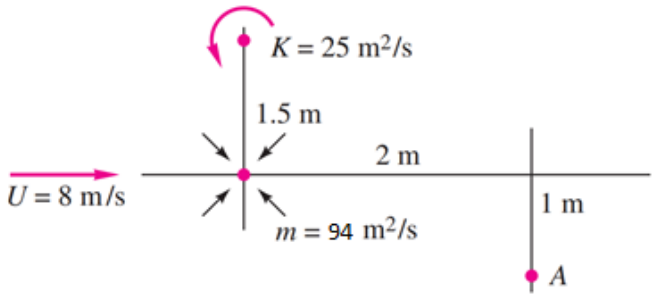
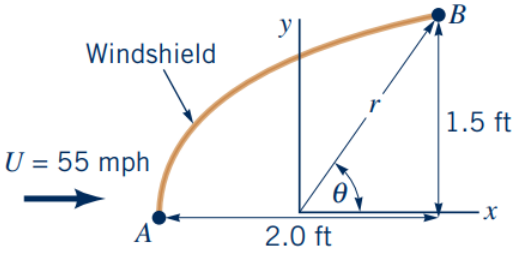
Dr Karimi
due date:
1402/10/10

In the name of Allah
Fluid Mechanics 2
Assignment5:
Ideal-flow

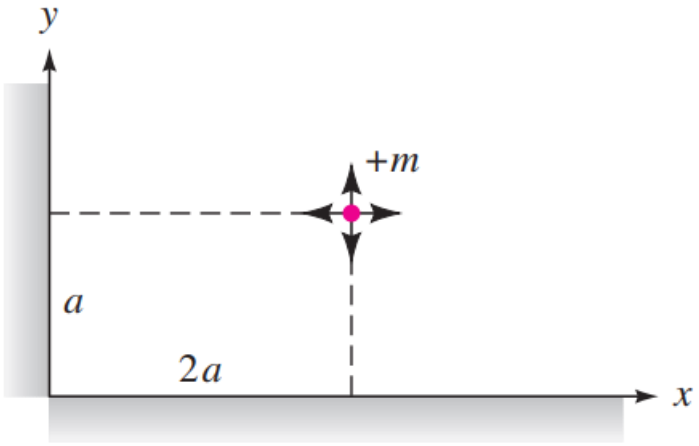
1- Find the resultant velocity vector induced at point A in the Figure by the uniform stream, vortex, and line source. (Note:$v_{source} = m/2\pi r$)



2- A vehicle windshield is to be shaped as a portion of a half-body with the dimensions shown in the figure. For a free-stream velocity of $55\ mph$, determine the velocity of the air at points *A* and *B*.

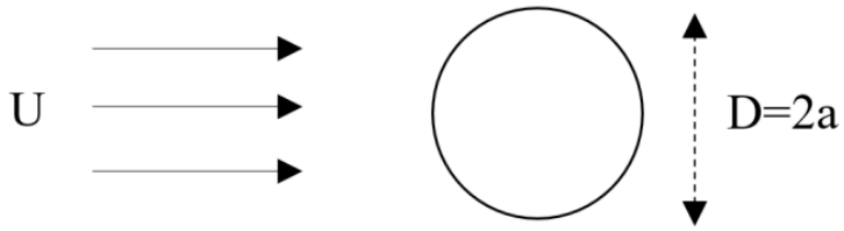


3- Set up an image system to compute the flow of a source at unequal distances from two walls, as in figure. Find the point of maximum velocity on the x axis. Calculate pressure at this point.



4- Consider the steady horizontal potential flow around the circular cylinder of diameter D=2a shown in the figure. Solve the Laplace equation over the flow field directly by separation of variables method with appropriate boundary conditions and find the velocity field.

$$\nabla^2 \emptyset = \emptyset_{rr} + \frac{1}{r}\emptyset_r + \frac{1}{r^2}\emptyset_{\theta\theta} = 0$$



5- The Flettner rotorship travels by the force developed due to the magnus effect of two rotating cylinders. Each cylinder has a diameter of 9 ft, a length of 50 ft, and rotates at 750 rev/min. Determine the magnitude of the total force developed by the two rotating cylinders assuming a wind-speed relative to the ship of

(a) 10 mph

(b) 30 mph