

# 1 Problem Class, 31 Oct

## 1.1 Question 1

A uniform stream flow with velocity  $U$  in the x-direction flows past a cylinder of radius  $a$  at the origin. From lectures:  $\psi = Ur \sin \theta (1 - \frac{a^2}{r^2})$ .

(a) Show that the line consisting of the x-axis for  $|x| > a$  and the upper half semi-circle boundary  $x^2 + y^2 = a^2, y > 0$  is a solid boundary compatible with the flow.

(b) Now consider the flow restricted to the upper half-plane. Show that the greatest value of fluid speed is attained at the top of the semi-circle.

(c) Where is the maximum vertical speed attained on the cylinder? Sketch lines of constant vertical velocity downstream.