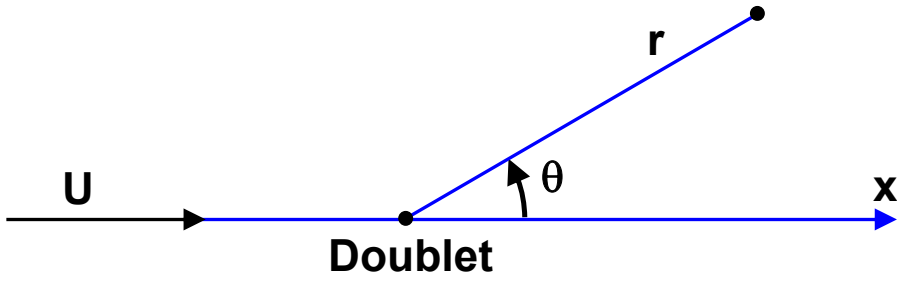
Problem 122A

The incompressible, axisymmetric potential flow around a sphere can be generated by superposition of a uniform stream ($\phi = Ux$) and a three-dimensional doublet whose potential is given by $A\cos\theta/r^2$ where A is a constant representing the doublet strength. The coordinates r, θ are centered on the doublet and the direction x ($x = r\cos\theta$) is in the direction of the uniform stream:



On the basis of this information construct the velocity potential for potential flow around a sphere of radius R in terms of U, R and the coordinates r, θ. What is the maximum velocity on the surface of the sphere ?