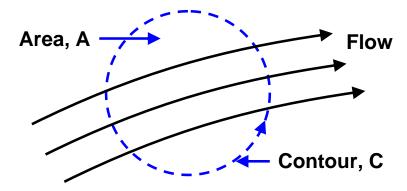## Problem 140A

Consider any closed contour, C, enclosing an area, A, in any planar incompressible flow (the area, A, contains only fluid):

The coordinate s is measured along the contour C and the "circulation", Γ, is defined as the line integral of the fluid velocity, $\underline{u}$, around the contour C:

$$\Gamma = \int_C \underline{u}.\underline{ds}$$

How is the circulation related to the vorticity of the flow inside the contour, C ?

Hint: Use Stokes' thereom:

$$\int_C \underline{u}.\underline{ds} = \int_A \nabla \times \underline{u} \; dA$$