3-5 (Unit B-4)

Consider, once again, a superposition of nonlifting flow over a cylinder and a vortex located at the center of the cylinder:

\[ \psi = (V_r \cdot r \sin \theta) \left( 1 - \frac{R^2}{r^2} \right) + \frac{\Gamma}{2\pi} \ln \frac{r}{R} \] (Note: \( R \) is the radius of the cylinder)

For the case of \( \theta = -\frac{\pi}{2} \) but \( r \neq R \), determine the equation of stagnation streamline. Let \( \Gamma = 5\pi V_r R \) (\( \Gamma > 4\pi V_r R \)). Sketch streamlines of flow field (including the stagnation streamline).

**Hints . . .**

- Work review problems, first.
- Substitute stagnation point(s) into streamfunction, in order to determine the equation of stagnation streamline.