(6)

$3.5r^2 + 1.2r + 0.315 = 0$

No solutions since $\left(\frac{1.2}{\pi}\right)^2 - 4\times3.5\times0.315 < 0$

If $\theta = \frac{3\pi}{2}$

$3.5r^2 - \frac{1.2r}{\pi} + 0.315 = 0$

No solutions since $\left(\frac{-1.2}{\pi}\right)^2 - 4\times3.5\times0.315 < 0$

∴ Only stagnation point at

$\left(0.3, \sin^{-1}\left(\frac{-4}{7\pi}\right)\right)$

ii) $\text{Lift} = -\int_S p\,dn$

$p = C - \frac{1}{2}\rho v^2$

and v on surface given by

$v_r = 0$ and $v_\theta = -7\sin\theta + \frac{4}{\pi}$

Hence $p = C - \frac{1}{2}\rho\left(-7\sin\theta + \frac{4}{\pi}\right)^2$

$$\text{Lift} = -\int_0^{2\pi}\left(C - \frac{1}{2}\rho\left(49\sin^2\theta - \frac{56}{\pi}\sin\theta + \frac{16}{\pi^2}\right)\right)(\cos\theta\, i + \sin\theta\, j)\,d\theta$$

$$= -2\pi\rho\left[\frac{1}{2}\theta - \frac{1}{4}\sin 2\theta\right]_0^{2\pi} = -2\pi\rho\ \text{N}$$