AERODYNAMICS (AER)
Lesson 2 – Part 1: Inviscid Flow – 2D Potential Flow of Ideal Liquid

EXAM 2012-13Q1

(x.x points) An airfoil flies horizontally in steady atmosphere at a velocity of 85 m/s (assume that the air is incompressible with density ρ = 1.225 kg/m^3). Fig. 1 shows the pressure coefficient distributions along the chord in the upper and lower surfaces for this airfoil at the corresponding angle of attack. The chord is 1.25 m. In this flight condition:

1. **(x.x points)** Compute the lift coefficient distribution, $c_l(x)$
2. **(x.x points)** Plot the lift coefficient distribution, $c_l(x)$, vs. x
3. **(x.x points)** Compute the airfoil global lift coefficient, c_l
4. **(x.x points)** Compute the position of the pressure centre, x_{cp} (as a % of the chord)
5. **(x.x points)** Compute the pitching moment coefficient respect to the aerodynamic centre, c_{mca}
6. **(x.x points)** Compute the lift, l
7. **(x.x points)** Compute the pitching moment respect to the aerodynamic centre, m_{ca}

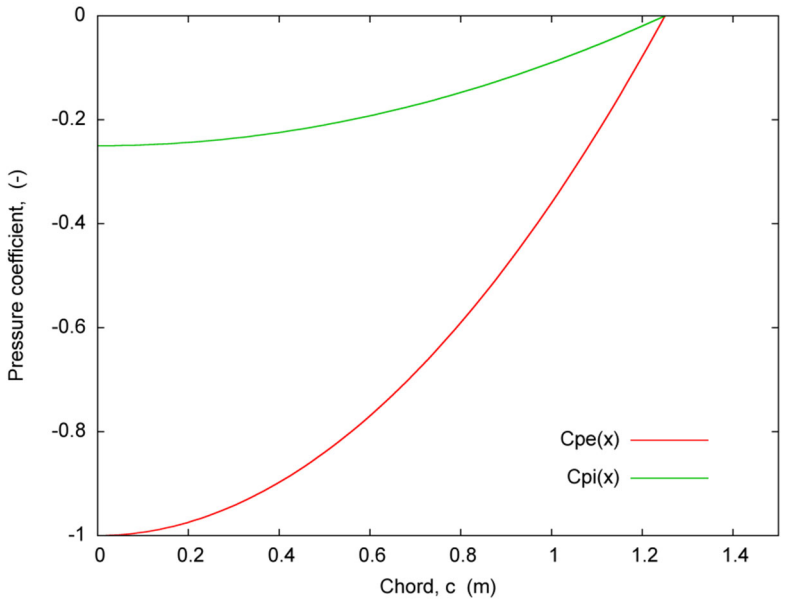

Fig. 1 Parabolic pressure coefficient distributions along the chord in the upper surface, $c_{pe}(x)$, and in the lower surface, $c_{pi}(x)$, for the studied airfoil. The distributions are such that they both exhibit a suction peak right in the leading edge, where $c_{pe}(0)$ = -1 and $c_{pi}(0)$ = -0.25