F3+F4. A symmetric airfoil has a trailing edge flap, with the hinge at $x_h/c = 0.75$, with the flap set at some small downward deflection angle δ.

a) Define and sketch the camberline-slope dZ/dx, both versus x and versus θ.

b) Use Thin Airfoil Theory to determine the airfoil's c_ℓ and $c_{m,c/4}$, as functions of α and δ.

c) Important quantities for an airplane-control designer are the flap *control derivatives*

$$\frac{\partial c_\ell}{\partial \delta} \quad , \qquad \frac{\partial c_{m,c/4}}{\partial \delta}$$

Determine these for the present flapped airfoil.
Note: You may wish to check your results with Xfoil. The GDES menu allows you to set a flap deflection.