

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  $\delta$ .

- a) Define and sketch the camberline-slope  $dZ/dx$ , both versus  $x$  and versus  $\theta$ .
- b) Use Thin Airfoil Theory to determine the airfoil's  $c_\ell$  and  $c_{m,c/4}$ , as functions of  $\alpha$  and  $\delta$ .
- c) Important quantities for an airplane-control designer are the flap *control derivatives*

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

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.