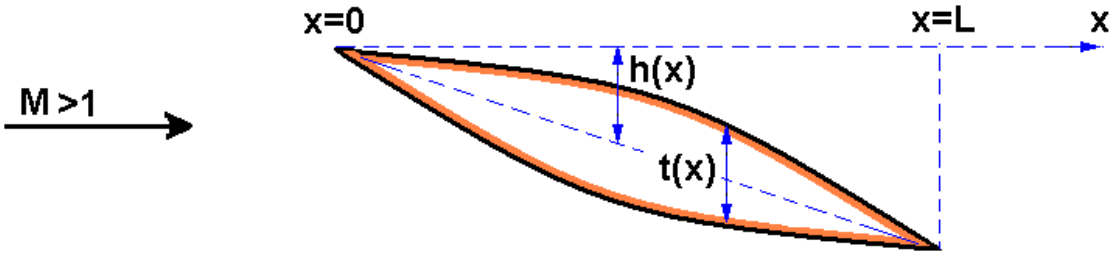
Problem 340D



A symmetric strut of chord, L, is placed at a small angle of attack, α, in a supersonic flow of Mach number, M. The geometry of the strut (sketched above) is such that the centerline is straight ($dh/dx = constant$) and the angle of attack is defined as the angle which this centerline makes with the oncoming stream ($dh/dx \approx \alpha$). In addition, the foil has thickness, $t(x)$, such that the ordinates of the suction and pressure surfaces are $h - t/2$ and $h + t/2$ respectively. More specifically, the shape of the strut is such that the thickness, $t(x)$, is related to the maximum thickness, t_M, at $x = L/2$ by $t(x) = 4t_M x(L - x)/L^2$. Using supersonic theory for small angles of turn (or otherwise if you wish!) find expressions for the lift and drag coefficients for this strut as functions of M, α and t_M/L.