Problem 340B

A curved but infinitely thin airfoil is placed in an oncoming supersonic stream of Mach Number, M. The shape of the foil is given by $h(x_1)$, $0 < x_1 < L$, as indicated below :
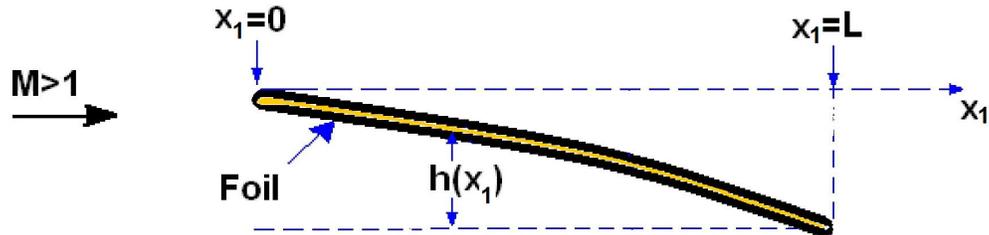
where x_1 is a coordinate parallel to the oncoming stream with its origin at the leading edge; the trailing edge is at $x_1 = L$. All the angles involved such as $h(x_1)/x_1$ or dh/dx_1 are quite small so that the usual trignometric approximations for small angles can be used. Use the theory of supersonic flow for small angles of turn to find expressions for the coefficient of lift, C_L, and the coefficient of drag, C_D, on the foil in terms of M and integrals involving the shape function, $h(x_1)$.