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Solutions to the linearized Navier-Stokes equations for channel flow via the WKB approximation ANTHONY LEONARD, California Institute of Technology — Progress on determining semi-analytical solutions to the linearized Navier-Stokes equations for incompressible channel flow, laminar and turbulent, is reported. Use of the WKB approximation yields, e.g., solutions to initial-value problem for the inviscid Orr-Sommerfeld equation in terms of the Bessel functions $J_{+1/3}, J_{-1/3}, J_1$, and Y_1 and their modified counterparts for any given wave speed $c = \omega/k_x$ and $k_\perp, (k_\perp^2 = k_x^2 + k_z^2)$. Of particular note to be discussed is a sequence $i = 1, 2, ...$ of homogeneous inviscid solutions with complex $k_{\perp i}$ for each speed c, $(0 < c \leq U_{max})$, in the downstream direction. These solutions for the velocity component normal to the wall v are localized in the plane parallel to the wall. In addition, for limited range of negative c, $(-c* \leq c \leq 0)$, we have found upstream-traveling homogeneous solutions with real $k_\perp(c)$. In both cases the solutions for v serve as a source for corresponding solutions to the inviscid Squire equation for the vorticity component normal to the wall ω_y.

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