Problem 4D.1

Flow near an oscillating wall.\(^8\) Show, by using Laplace transforms, that the complete solution to the problem stated in Eqs. 4.1-44 to 47 is

\[
\frac{v_x}{v_0} = e^{-\sqrt{\omega/2\nu y}} \cos(\omega t - \sqrt{\omega/2\nu y}) - \frac{1}{\pi} \int_0^\infty e^{-\bar{\omega}t} (\sin \sqrt{\bar{\omega}/\nu y}) \frac{\bar{\omega}}{\omega^2 + \bar{\omega}^2} d\bar{\omega}
\]

(4D.1-1)

---

\(^8\) H. S. Carslaw and J. C. Jaeger, *Conduction of Heat in Solids*, Oxford University Press, 2nd edition (1959), p. 319, Eq. (8), with \(\varepsilon = \frac{1}{2} \pi\) and \(\bar{\omega} = \kappa u^2\).

www.stemjock.com