BOOK REVIEWS

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The linearization method in hydrodynamical stability theory, by V. I. Yudovich. Translated from Russian by J. R. Schulenberger. Translations of Mathematical Monographs, vol. 74, American Mathematical Society, Providence, R.I., 170 pp., $74.00. ISBN 0-8218-4528-4

V. I. Yudovich is a well-known researcher in the mathematical theory of the Navier-Stokes equations in the USSR. In the 1960s he proved a number of results in stability theory and in the bifurcation of steady state and time periodic solutions of the Navier-Stokes equations. In this monograph he develops the fundamental mathematical theory and gives extensive proofs of the basic stability theorems.

In Chapter I the L_p theory of the Navier-Stokes equations is developed. A summary of interpolation theory, singular integral operators, and the Calderon–Zygmund theory is given. Then L_p estimates for elliptic and parabolic equations and the linearized Navier-Stokes equations are given. The L_p theory of the projection Π onto the solenoidal vector fields is given and of the resolvent of the Stokes operator.

In Chapter II the linearized stability theory of the Navier-Stokes equations is developed. One of the main results is that if $p > 3$, the L_p norm of the initial perturbation from equilibrium is sufficiently small, and the spectrum of the linearized stability operator is contained in the right half plane, then the solution is regular, exists for all time, and tends to equilibrium as $t \to \infty$.

The regularity theorem of the Navier-Stokes equations has never been completely resolved. It is known that weak solutions exist for all time; but it has never been proved for general initial data, even