a notion which has also been introduced by A. D. Michal this may be re-expressed in the form: If a function on an open set of a complex Banach space to a complex Banach space has a derivative, it possesses a Fréchet differential. (Received January 22, 1946.)

APPLIED MATHEMATICS

79. R. J. Duffin: *Nonlinear networks.* II.

A system of n nonlinear differential equations is studied and shown to have a unique asymptotic solution; that is, all solutions approach each other as the independent variable becomes infinite. The interest of these equations is that they describe the forced vibration of electrical networks. Consider an arbitrary linear network of inductors, resistors, and capacitors which has no undamped free modes of vibration. A given impressed force may give rise to more than one response but as time goes on there is a unique association between impressed force and response. This, of course, is well known. The main result of this note states that if the linear resistors of such a network are replaced by quasi-linear resistors then there still is this unique asymptotic association. A quasi-linear resistor is one in which the potential drop across it and the current through it are increasing functions of one another. No other sort of nonlinearity besides this type of nonlinear damping is considered. The proof is made to rest solely on well known properties of the Laplace transform and Hermitian forms. (Received January 19, 1946.)

80. Herbert Jehle: *Transformation of hydrodynamical equations of stellar dynamics.*

In abstract 51-9-170, the author pointed out a transformation of continuity equation and Bernoulli equation into a Schroedinger equation. The presence of $\bar{\sigma}$ (replacing $\hbar/m$ of wave mechanics) implies no modification of classical equations of motion, but a statement about residual velocities or "pressure function." Assume that the distribution (numbers and intensities) of excited ψ_{nlm} states (n goes up to about 10^5 for the author's choice of $\bar{\sigma}$) corresponds statistically to the distribution (in numbers and masses) of statistically independent elements of a system. It is known that if all stationary ψ_{nlm} states are filled up to a certain frequency limit with one element (particle) per state there will be an average of one element per phase space volume $(2\pi\bar{\sigma})^3$ for the inner regions. The above assumption is therefore equivalent to the assumption of an upper limit for the expectation value of density (of numbers) of statistically independent elements in six-dimensional phase space. This is a plausible assumption for systems close to statistical equilibrium; it means that too great densities in position space without large residual velocities cause aggregations of formerly independent masses into larger independent units. (Received January 21, 1946.)

81. R. S. Phillips: *rms error criterion in servo system design.*

A servomechanism is required to follow a signal from a knowledge of only the error in following. This error signal is usually a mixture of the true following error and some sort of random disturbance. The servo must make a compromise between following the original signal and not following the noise. This paper presents a method by which this compromise can be made. Assuming that the spectra of the signal and noise are known, one can then determine that servo system which minimizes the rms error in following. Actually the paper limits itself to determining the best values of control parameters when the type of control is given. It is assumed that the servo