

# On the $\Gamma$ -stability of systems of differential equations in the Routh-Hurwitz and the Schur-Cohn cases

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## Abstract

If  $\Gamma$  is a pathwise-connected region in the complex plane, the problem of  $\Gamma$ -stability consists of establishing necessary and sufficient conditions on a set  $S$  of  $n$ -th degree polynomials to have their zeros inside  $\Gamma$ . In the present work, this problem is settled in the special case when  $\Gamma$  is either the imaginary axis or the unit circle and  $S$  is the set of all convex combinations of real or complex polynomials which are stable in the Routh-Hurwitz or the Schur-Cohn sense. Such conditions are required in problems related to the stability of complex systems of differential equations whose coefficients are subject to perturbations.

## 1 Introduction

The problem of eigenvalue distribution of systems of differential equation with respect to a given curve has been studied for quite a long time. The most commonly used curves are the imaginary axis and the unit circle due to the importance of the problem of stability of linear systems. Very efficient solutions have been devised to handle these two special cases, but they are mainly restricted to the case of real coefficients. Among these solutions, the Routh-Hurwitz test for the imaginary axis case and the Schur-Cohn test for the unit circle case are the most celebrated. In this respect the list of references is long indeed, and we confine it to [1], [2] and [4]

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