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# AN ANALYSIS OF THE POLE PLACEMENT PROBLEM. I. THE SINGLE-INPUT CASE *

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**Abstract.** For the solution of the single-input pole placement problem we derive explicit expressions for the feedback gain matrix as well as the eigenvector matrix of the closed-loop system. Based on these formulas we study the conditioning of the pole-placement problem in terms of perturbations in the data and show how the conditioning depends on the condition number of the closed loop eigenvector matrix, which is a similar to a generalized Cauchy matrix, the norm of the feedback vector and the distance to uncontrollability.

**Key words.** pole placement, condition number, perturbation theory, Jordan form, explicit formulas, Cauchy matrix, stabilization, feedback gain, distance to uncontrollability.

**AMS subject classifications.** 65F15, 65F35, 65G05, 93B05, 93B55.

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