## ON STEIN-ROSENBERG TYPE THEOREMS FOR NONNEGATIVE SPLITTINGS

## **Dimitrios Noutsos**

Department of Mathematics, University of Ioannina, GR-45110 Ioannina, Greece, e-mail: dnoutsos@uoi.gr

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## Abstract

The Stein-Rosenberg theorem is extended and generalized to the classes of nonnegative splittings  $A = M_1 - N_1 = M_2 - N_2$ , of the first kind  $(M_1^{-1}N_1 \ge 0, M_2^{-1}N_2 \ge 0)$  and also of the second kind  $(N_1M_1^{-1} \ge 0, N_2M_2^{-1} \ge 0)$ . Two types of the Stein-Rosenberg theorem are stated and proved under the main assumption that the series of inequalities  $M_1^{-1}N_1 \ge M_1^{-1}N_2 \ge 0$ ,  $M_1^{-1}N_1 \ne M_1^{-1}N_2$ ,  $M_1^{-1}N_2 \ne 0$  or  $M_2^{-1}N_1 \ge M_2^{-1}N_2 \ge 0$ ,  $M_2^{-1}N_1 \ne M_2^{-1}N_2$ ,  $M_2^{-1}N_2 \ne 0$  hold. These theorems allow us to obtain comparison results for the rate of convergence of the associated iterative methods. Specific assumptions are given under which the inequalities of the spectral radii become equalities or strict inequalities. The theoretical results are confirmed by numerical examples. Finally, some ideas as to how the present theory can be extended to cover the Perron-Frobenius splittings are presented.

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