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NONLINEAR DIFFERENTIAL INEQUALITY

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Abstract. A nonlinear differential inequality is formulated in the paper. An estimate of the rate of growth/decay of solutions to this inequality is obtained. This inequality is of interest in a study of dynamical systems and nonlinear evolution equations in Banach spaces. It is applied to a study of global existence of solutions to nonlinear partial differential equations.

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REFERENCES

[1] YU. L. DALECKII, M. G. KREIN, *Stability of solutions of differential equations in Banach spaces*, Amer. Math. Soc., Providence, RI, 1974.
[2] B. P. DEMIDOVICH, *Lectures on stability theory*, Nauka, Moscow, 1967 (in Russian)
[3] P. HARTMAN, *Ordinary differential equations*, J. Wiley, New York, 1964.
[4] N. S. HOANG, A. G. RAMM, *Dynamical Systems Gradient Method for solving nonlinear operator equations with monotone operators*, Acta Appl. Math., **106**, (2009) , 473–499.
[5] N.S. HOANG AND A. G. RAMM, *A nonlinear inequality*, J. Math. Inequal., **2**, 4, (2008), 459–464.
[6] N.S. HOANG AND A. G. RAMM, *A nonlinear inequality and applications*, Nonlinear Analysis: Theory, Methods & Applications, **71**, (2009), 2744–2752.
[7] M. A. KRASNOSEL'SKII, *The operator of translation along the trajectories of differential equations*. Translations of Mathematical Monographs, Vol. 19, Providence, R.I. 1968.
[8] S. G. KREIN, *Linear differential equations in Banach spaces*, Amer. Math. Soc., Providence, RI, 1971.
[9] V. LAKSHMIKANTHAM, S. LEELA, *Differential and integral inequalities; theory and applications*, Academic Press, New York, 1969.
[10] A. PAZY, *Semigroups of linear operators and applications to partial differential equations*, Springer-Verlag, New York, 1983.
[11] A. G. RAMM, *Dynamical systems method for solving operator equations*, Elsevier, Amsterdam, 2007.
[12] A. G. RAMM, *Asymptotic stability of solutions to abstract differential equations*, Journ of Abstract Diff. Equations, (JADEA), **1**, 1, (2010), 27–34.
[13] J. SCHRÖDER, *Operator inequalities*, Acad. Press, New York, 1980.
[14] J. SZARSKI, *Differential inequalities*, PWN, Warszawa, 1967.

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