

NEW RESULTS ON THE ASYMPTOTIC BEHAVIOR OF A THIRD-ORDER NONLINEAR DIFFERENTIAL EQUATION

MATHEW OMEIKE

Abstract. Sufficient conditions are established for the asymptotic behavior of a third-order nonlinear differential equation. Our results improve on Qian's [C. Qian, Asymptotic behavior of a third-order nonlinear differential equation, *J. Math. Anal. Appl.*, 284 (2003), 191–205]

Mathematics subject classification (2010): 34B15, 34C11.

Keywords and phrases: nonlinear differential equation, asymptotic behavior, Lyapunov's method.

REFERENCES

- [1] E. A. BARBASHIN, *Lyapunov Functions*. Izda. 'Nauka', Moscow, 1970.
- [2] J. O. C. EZEILO, *An elementary proof of a boundedness theorem for a certain third order differential equation*, *J. Lond. Math. Soc.*, **38** (1963), 11–16.
- [3] J. O. C. EZEILO, *Stability results for the solution of some third and fourth order differential equations*, *Ann. Mat. Pura Appl.*, **66** (1964), 233–249.
- [4] M. GERA, J. R. GRAEF, M. GREGUS, *On oscillatory and asymptotic properties of solutions of certain nonlinear third order differential equations*, *Nonlinear Anal.*, **32** (1998), 417–425.
- [5] C. QIAN, *On global stability of third-order nonlinear differential equations*, *Nonlinear Analysis*, **42** (2000), 651–661.
- [6] C. QIAN, *Asymptotic behavior of a third-order nonlinear differential equation*, *J. Math. Anal. Appl.*, **284** (2003,) 191–205.
- [7] M. O. OMEIKE, *Further results on global stability of third-order nonlinear differential equations*, *Nonlinear Anal.*, **67** (2007), 3394–3400.
- [8] R. REISSIG, G. SANSONE, R. CONTI, *Nonlinear Differential Equations of Higher Order*, Noordhoff Inter. Pub. Leyden, 1974.
- [9] C. TUNC, *On the ultimate boundedness result of the solutions of certain fourth order differential equation*, *Ann. Differential Equations*, **14** (1998), 475–485.
- [10] T. YOSHIKAWA, *On the evaluation of the derivatives of solutions of $y' = f(x, y, y')$* , *Mem. Coll. Sc. Univ. Kyoto, Series A*, **28** (1953), 27–32.
- [11] T. YOSHIKAWA, *Asymptotic behavior of solutions of a system of differential equations*, *Contrib. Differential Equations*, **1** (1963), 371–387.