

A NONOSCILLATION THEOREM FOR HALF-LINEAR DIFFERENTIAL EQUATIONS WITH DELAY NONLINEAR PERTURBATIONS

NAOTO YAMAOKA

Abstract. This paper deals with the oscillation problem for nonlinear differential equations with delay. A sufficient condition is obtained for the equation to have a nonoscillatory solution. The main result is the best possible in a certain sense. Examples are given to illustrate the main result.

Mathematics subject classification (2000): 34K11, 34C10.

Keywords and phrases: oscillation, half-linear differential equation, delay, nonlinear perturbations.

REFERENCES

- [1] O. DOŠLÝ, *Oscillation criteria for half-linear second order differential equations*, Hiroshima Math. J., **28** (1998), 507–521.
- [2] O. DOŠLÝ, *Perturbations of the half-linear Euler-Weber type differential equation*, J. Math. Anal. Appl., **323** (2006), 426–440.
- [3] O. DOŠLÝ AND A. LOMTATIDZE, *Oscillation and nonoscillation criteria for half-linear second order differential equations*, Hiroshima Math. J., **36** (2006), 203–219.
- [4] O. DOŠLÝ AND P. ŘEHÁK, *Half-linear differential equations*, North-Holland Mathematics Studies, **202**, Elsevier, Amsterdam, 2005.
- [5] Á. ELBERT, *A half-linear second order differential equation*, *Qualitative theory of differential equations*, Vol. I, II (Szeged, 1979), pp. 153–180, Colloq. Math. Soc. János Bolyai, **30**, North-Holland, Amsterdam-New York, 1981.
- [6] Á. ELBERT AND A. SCHNEIDER, *Perturbations of the half-linear Euler differential equation*, Results Math., **37** (2000), 56–83.
- [7] H.-L. HONG, W.-C. LIAN AND C.-C. YEH, *Oscillation criteria for half-linear differential equations with functional arguments*, Nonlinear World, **3** (1996), 849–855.
- [8] H. J. LI AND C. C. YEH, *Sturmian comparison theorem for half-linear second-order differential equations*, Proc. Roy. Soc. Edinburgh Sect. A, **125** (1995), 1193–1204.
- [9] J. D. MIRZOV, *On some analogs of Sturm's and Kneser's theorems for nonlinear systems*, J. Math. Anal. Appl., **53** (1976), 418–425.
- [10] Z. PÁTÍKOVÁ, *Asymptotic formulas for non-oscillatory solutions of perturbed half-linear Euler equation*, Nonlinear Anal., **69** (2008), 3281–3290.
- [11] J. SUGIE AND M. IWASAKI, *Oscillation of the Riemann-Weber version of Euler differential equations with delay*, Georgian Math. J., **7** (2000), 577–584.
- [12] J. SUGIE AND M. ONITSUKA, *A non-oscillation theorem for nonlinear differential equations with p -Laplacian*, Proc. Roy. Soc. Edinburgh Sect. A, **136** (2006), 633–647.
- [13] J. SUGIE AND N. YAMAOKA, *Growth conditions for oscillation of nonlinear differential equations with p -Laplacian*, J. Math. Anal. Appl., **306** (2005), 18–34.
- [14] J. SUGIE AND N. YAMAOKA, *Comparison theorems for oscillation of second-order half-linear differential equations*, Acta Math. Hungar., **111** (2006), 165–179.
- [15] C. A. SWANSON, *Comparison and oscillation theory of linear differential equations*, Academic Press, New York-London, 1968.
- [16] N. YAMAOKA AND J. SUGIE, *Oscillation caused by delay perturbation in half-linear differential equations*, Dynam. Systems Appl., **14** (2005), 365–379.