

International Workshop on Dynamical Systems and Applications (IWDSA 2019)  
*In Memory of Prof. Dr. Aydın Tiryaki*  
Gazi University, Ankara, Turkey, 3-4 May 2019

## On asymptotic integration of second-order delay differential equations

R.P. Agarwal<sup>1</sup>, T. Ertem<sup>2</sup>, A. Zafer<sup>3</sup>

<sup>1</sup> *Texas A&M University, Kingsville, TX, USA, ravi.agarwal@tamuk.edu*

<sup>2</sup> *Toros University, Mersin, Turkey, turker.ertem@toros.edu.tr*

<sup>3</sup> *American University of the Middle East, Egaila, Kuwait,  
agacik.zafer@aum.edu.kw*

### Abstract

In this work, we study the asymptotic integration problem for second-order nonlinear delay differential equations of the form  $((p(t)x'(t))' + q(t)x(t) = f(t, x(g(t)))$ . It is shown that solutions are asymptotic to prescribed solutions of the associated linear homogeneous equation  $((p(t)x'(t))' + q(t)x(t) = 0$  at infinity.

**Key Words:** Delay differential equation, Asymptotic integration, Fixed point theory, Principal solutions.

### References

- [1] R.P. Agarwal, T. Ertem, A. Zafer, Asymptotic integration of nonlinear second-order delay differential equations, *Appl. Math. Lett.*, 48 (2015), 128-134.
- [2] R.P. Agarwal, T. Ertem, A. Zafer, A survey on asymptotic integration of differential equations, in preparation.
- [3] T. Ertem, A. Zafer, Asymptotic integration of second-order nonlinear differential equations via principal and nonprincipal solutions, *Appl. Math. Comput.*, 219 (2013), 5876-5886.
- [4] R.P. Agarwal, S. Djebali, T. Moussaoui, O.G. Mustafa, On the asymptotic integration of nonlinear differential equations, *J. Comput. Appl. Math.*, 202 (2007), 352-376.