International Conference Mathematical and Informational Technologies, MIT-2011 IX Conference "Computational and Informational Technologies for Science, Engineering and Education" Vrnjačka Banja, Serbia, August 27 – 31, 2011

## Karamata class solutions of Friedman equation

Žarko Mijajlović Faculty of Mathematics, University of Belgrade Studentski Trg 16,Belgrade, Serbia zarkom@matf.bg.ac.rs

## Abstract

We discuss asymptotic behaviors at infinity of solutions of the system of the following three differential equations:

The Friedman acceleration equation

$$\frac{\ddot{a}}{a} = -\frac{4\pi G}{3} \left( \rho + \frac{3p}{c^2} \right),$$

the fluid equation

$$\dot{\rho} + 3\frac{\dot{a}}{a}\left(\rho + \frac{p}{c^2}\right) = 0,$$

and the Friedman equation

$$\left(\frac{\dot{a}}{a}\right)^2 = \frac{8\pi G}{3}\rho - \frac{kc^2}{a^2}$$

These equations appear in the study of the expansion scale factor a(t) of the Universe. We discuss this system by use of the theory of regularly varying functions, also known as Karamata functions. As a result we obtain that the solutions of the system might have a multiplicative term which is a slowly varying function. Under usual assumptions for the scale factor a(t), it appears that this slowly varying term exists.