Homework #4 **Deadline: April 10, 2019, 12:20.**

1. Rewrite all models that are present in the formulae (4.155)–(4.171) [see material *J. Málek, V. Průša: Derivation of equations for continuum mechanics and thermodynamics of fluids*] into the form

$$\beta_1(\operatorname{tr}\mathbf{T}, \operatorname{tr}\mathbf{T}_\delta^2, \operatorname{tr}\mathbf{D}^2)\mathbf{D} + \beta_2(\operatorname{tr}\mathbf{T}, \operatorname{tr}\mathbf{T}_\delta^2, \operatorname{tr}\mathbf{D}^2)\mathbf{T}_\delta = \mathbf{O}. \tag{1}$$

   Your task is to find the functions β_1 a β_2. A symbol $\mathbf{T}_\delta$, used in (1) denotes a deviatoric part of the Cauchy stress tensor $\mathbf{T}$.

   Explain, why (1) describes a constitutive relation for an incompressible material.

2. Assume that $\mathbb{A}$ is an objective tensor. Decide if the following generalized time derivative of $\mathbb{A}$ is objective:

$$\overset{\circ}{\mathbb{A}} := \frac{\mathrm{d}\mathbb{A}}{\mathrm{d}t} - \mathbf{\Omega}\mathbb{A} + \mathbb{A}\mathbf{\Omega},$$

   where $\mathbf{\Omega} = \dot{\mathbf{R}}\mathbf{R}^T$ a $\mathbf{R}$ is a tensor of rotation from the polar decomposition of the deformation gradient.