# Homework 2. Continuum mechanics

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1. Problem 1

A Lagrangian description of continuum motion is

, .

where 𝑘1 and 𝑘2 are constants. Find the velocity and acceleration fields using

1. Lagrangian description

,  ,

,  ,

1. Eulerian description
2. Problem 2

Introduce Lagrangian coordinates and find a Lagrangian description of continuum motion if its velocity field is represented with the following equations:

subjected to initial conditions:

1. Problem 3

The position of the particles in continuum medium can be found using:

Find the unit elongations and the decreases in angles between the basis directions of the particles.

At time 𝑡 = 2, find the unit elongation of a particle initially in the direction of .

- unit elongation in direction

- unit elongation in direction

- unit elongation in direction

angle between the directions

angle between the directions

angle between the directions

1. Problem 4

Strains in the medium are characterized with the strain tensor:

Find the Lagrangian coordinates of particles whose volume does not change.

Finally:

1. Problem 5

Given the displacement field of a continuum in Eulerian coordinates:

Find for which 𝑘 the field is describing the displacements of a rigid body.

A rigid body is a non-deformable body, which means that all components of the strain tensor are equal to zero.