# Homework 4. Continuum mechanics

1. Problem 1

Find the pressure distribution of a linearly viscous fluid if its flow is described by the velocity field:

Consider the body forces are represented only by the gravitation: . The pressure at origin

is 2

From i =2 take all with , but without ,from i=3, all without and put it all in

1. Problem 2

The steady laminar flow of a viscous incompressible fluid (with viscosity coefficient 𝜇) in a pipe is created by known pressure gradient and defined by the velocity field:

Find coefficients 𝐶1 and 𝐶2 if the no-slip condition is satisfied on pipe walls, which an elliptical cross section described by . Neglect body forces.

On the walls

1. Problem 3

The stress inside an elastic sphere (the material is isotropic with is the following:

1. find Lame’s coefficients.
2. find the maximum shear stress in the sphere, if the relative sphere volume change is , where .

Max shear stress:

1. A thin rectangular plate of dimensions 30 cm x 50 cm was formed by welding two triangular plates. The plate was elongated by 5 cm in the long direction and compressed by 3 cm in the short direction. Determine the normal stress acting perpendicular to the weld line and the shear stress acting parallel to the weld. Consider that the plate and the weld are made of steel and assume that the deformations are small.

For steel:

1. Problem 5

TRANSVERSELY ISOTROPIC LINEARLY ELASTIC SOLID

Because of symmetry:

We get:

Elongation in is

Elongation in is

Elongation in is

Angle between

Angle between

Angle between