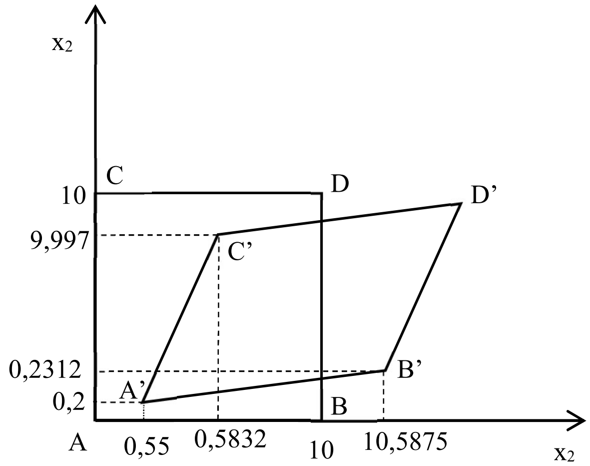
Université Mohamed - KHIDER - BISKRA
Département de Génie Mécanique – Elasticity - 2025/2026
Responsable du Module : Pr. HECINI M.

Travaux Dirigés (**Série N°2**)

Exercise N° 01 :

A square ABCD with side length 10 is drawn at point A in the plane (A/ x_1, x_2). After loading, and with respect to a fixed coordinate system, we obtain the parallelogram A'B'C'D'.

Determine the components ε_{ij} of the matrix associated with the pure strain tensor and the rotation of the medium.



Exercise N° 02 :

We consider the following displacement field u= P_0 P_1 =$(u_1, u_2, u_3)^T$:

$$u_1 = 730.10^{-6}\, x_1 + 350.10^{-6}\, x_2$$
$$u_2 = 430.10^{-6}\, x_1 + 145.10^{-6}\, x_2$$
$$u_3 = -375.10^{-6}\, x_3$$

1°) Determine the Grad(u) tensor. Deduce the pure strain and rotation tensors, as well as the rotation vector.
2°) Determine the principal strains and principal directions
3°) Determine the angle (x_1, X_1) that the x_1 (or e_1) makes with the principal axis X_1
4°) Determine the unit elongation and the relative slip in the direction n making an angle of 45° with the x_1 axis (or e_1) and perpendicular to the x_3 axis (or e_3).

Déterminer l'allongement unitaire et le glissement relatif dans la direction n faisant un angle de 45° avec l'axe x_1 (ou e_1) et perpendiculaire à l'axe x_3 (ou e_3).

Exercise N° 03 :

Show that the proportional increase of an elementary volume ΔV/V is given by:

$$\Delta V/V = tr(\mathscr{E})$$

What happens to an elementary sphere after deformation?