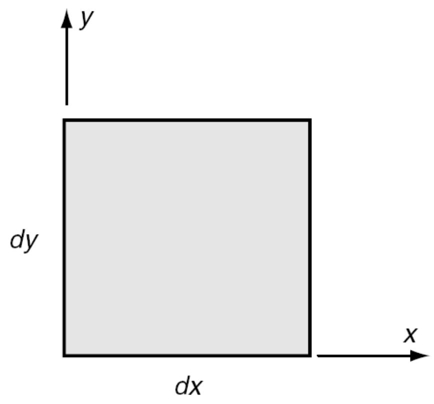
2-1. Determine the strain and rotation tensors e_{ij} and ω_{ij} for the following displacement field:

$$u = Axy, \ v = Bxz^2, \ w = C(x^2 + y^2)$$

where A, B, and C are constants.

2-2. A two-dimensional displacement field is given by $u = k(x^2 + y^2), \ v = k(2x - y), \ w = 0$, where k is a constant. Determine and plot the deformed shape of a differential rectangular element originally located with its left bottom corner at the origin as shown. Finally, calculate the rotation component ω_z.



2-3. A two-dimensional problem of a rectangular bar stretched by uniform end loadings results in the following constant strain field:

$$e_{ij} = \begin{bmatrix} C_1 & 0 & 0 \\ 0 & -C_2 & 0 \\ 0 & 0 & 0 \end{bmatrix}$$

where C_1 and C_2 are constants. Assuming the field depends only on x and y, integrate the strain-displacement relations to determine the displacement components and identify any rigid-body motion terms.

2-4. A three-dimensional elasticity problem of a uniform bar stretched under its own weight gives the following strain field:

$$e_{ij} = \begin{bmatrix} Az & 0 & 0 \\ 0 & Az & 0 \\ 0 & 0 & Bz \end{bmatrix}$$

where A and B are constants. Integrate the strain-displacement relations to determine the displacement components and identify all rigid-body motion terms.

2-5. A rectangular parallelepiped with original volume V_o is oriented such that its edges are parallel to the principal directions of strain as shown in the following figure. For small strains, show that the dilatation is given by

$$\vartheta = e_{kk} = \frac{\text{change in volume}}{\text{original volume}} = \frac{\Delta V}{V_o}$$