

1. Given the following relation

	Tensor	Undeformed	Relation	Deformed
point	0	$\underline{X}$	$\underline{x} = \chi(\underline{X})$	$\underline{x}$
infilnitesimal elements	1	$d\underline{X}$	$d\underline{x} = F d\underline{X}$	$d\underline{x}$
line length	1	$dL$	$\sqrt{c_{11}}, \sqrt{c_{22}}, \sqrt{c_{33}}$	$dl$
angle	0	$d\underline{X}, d\underline{Y}$	$\cos(\theta) = \frac{c_{12}}{\sqrt{c_{11}}\sqrt{c_{22}}}$	$d\underline{x}, d\underline{y}$
area	0	$d\underline{X}, d\underline{Y}$	$da = \sqrt{c_{11}c_{22} - c_{12}^2} dA$	$d\underline{x}, d\underline{y}$
volume	0	$d\underline{X}, d\underline{Y}, d\underline{Z}$	$dv = J dV$	$d\underline{x}, d\underline{y}, d\underline{z}$

where  $F_{ij} = \frac{\partial x_i}{\partial X_j}$ ,  $J = \det |F|$ ,  $C = F^T F$ .

2. Given the following deformation

$$\bar{x} = x + u = 1.05x \cos(\alpha) - 0.98y \sin(\alpha)$$

$$\bar{y} = y + v = 1.05x \sin(\alpha) + 0.98y \cos(\alpha)$$

$$\bar{z} = z + w = z$$

where  $\alpha = 60^\circ$ .

3. Given the following deformation

$$\bar{x} = x + u = x + \frac{\sqrt{3}}{2}y$$

$$\bar{y} = y + v = y$$

$$\bar{z} = z + w = z$$

4. Using the examples in **2**, **3**, construct Table in **1**.