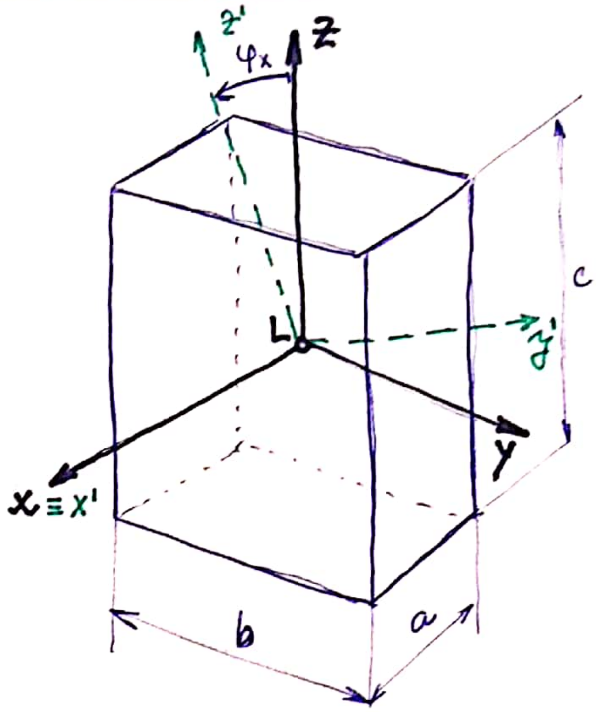
MATRIX TRANSFORMATION - ROTATION



ORIGINAL SYSTEM: (L, x, y, z)

we need to transform the matrix of inertia to

NEW SYSTEM: (L', x', y', z')

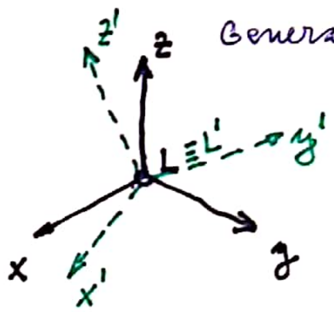
$$\boxed{\mathbb{I}' = \mathbb{T}^T \cdot \mathbb{I}\,\mathbb{T}}$$

$\mathbb{I}$ ... matrix of inertia for original system (L, x, y, z)

$\mathbb{I}'$ ... matrix of inertia for new system (L', x', y', z')

$\mathbb{T}$ .... transformation matrix for axes rotation from NEW to ORIGINAL system

Generally:



Cube:

$$\mathbb{I} = \begin{bmatrix} \frac{1}{12}m(b^2+c^2) & 0 & 0 \\ 0 & \frac{1}{12}m(a^2+c^2) & 0 \\ 0 & 0 & \frac{1}{12}m(a^2+b^2) \end{bmatrix}$$

$$\mathbb{T}_x = \begin{array}{cc} \begin{array}{ccc} x & y & z \end{array} & \\ \begin{bmatrix} 1 & 0 & 0 \\ 0 & \cos\varphi_x & \sin\varphi_x \\ 0 & -\sin\varphi_x & \cos\varphi_x \end{bmatrix} & \begin{array}{c} x \\ y \\ z \end{array} \end{array}$$

φ_x ... from old (ORIGINAL) to NEW system

$$\mathbb{I}' = \frac{1}{12}m \begin{bmatrix} 1 & 0 & 0 \\ 0 & \cos\varphi_x & \sin\varphi_x \\ 0 & -\sin\varphi_x & \cos\varphi_x \end{bmatrix} \cdot \begin{bmatrix} b^2+c^2 & 0 & 0 \\ 0 & a^2+c^2 & 0 \\ 0 & 0 & a^2+b^2 \end{bmatrix} \cdot \begin{bmatrix} 1 & 0 & 0 \\ 0 & \cos\varphi_x & \sin\varphi_x \\ 0 & -\sin\varphi_x & \cos\varphi_x \end{bmatrix} =$$