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10.30

$$I_{xx} = \rho \int y^2 dy$$

$$I_{xy} = \rho \int \int xydxdy$$

$$I_{xz} = 0$$

$$I_{yx} = \rho \int \int xydxdy$$

$$I_{yy} = \rho \int x^2 dx$$

$$I_{yz} = 0$$

$$I_{zx} = 0$$

$$I_{zy} = 0$$

$$I_{zz} = \rho \int \int x^2 + y^2 dxdy$$

$$I = \begin{bmatrix} \rho \int y^2 dy & \rho \int \int xydxdy & 0 \\ \rho \int \int xydxdy & \rho \int x^2 dx & 0 \\ 0 & 0 & \rho \int \int x^2 + y^2 dxdy \end{bmatrix}$$

$$\det I = \rho^2 \int \int x^2 + y^2 dxdy \Big[\rho \int y^2 dy \int x^2 dx - \Big(\int \int xydxdy \Big)^2 \Big]$$

Thus the perpendicular axis is perpendicular to the lamina.

10.35(a)

$$I = ma^2 \begin{bmatrix} 17 & 0 & 0 \\ 0 & 6 & -1 \\ 0 & -1 & 6 \end{bmatrix}$$

(b)

$$\det(I - \lambda I_3) = 5, 7, 17$$

$$v_1 = (0, 1, 1)$$

$$v_2 = (0, -1, 1)$$

$$v_3 = (1, 0, 0)$$

10.39

$$\Omega = \frac{MgR}{\lambda \omega} \hat{z} = \frac{MgR}{\frac{3}{10} Mr^2 \omega} \hat{z}$$

$$\Omega = \frac{9.8 \times 10}{\frac{3}{10} 2.5^2 \times 1800} \approx 0.029$$