Moments of inertia and center of mass

Planar lamina R with density $\rho(x,y)$ and mass M

Moment of inertia about the x-axis	$I_x = \iint_R y^2 \rho(x,y)\,dA$
Moment of inertia about the y-axis	$I_y = \iint_R x^2 \rho(x,y)\,dA$
Center of Mass	$M = \iint_R \rho(x,y)\,dA$ $m_x = \iint_R y\rho(x,y)\,dA \qquad m_y = \iint_R x\rho(x,y)\,dA$ $\bar{x} = \dfrac{m_x}{M}, \quad \bar{y} = \dfrac{m_y}{M}$

Solid region Q with density $\rho(x,y,z)$ and mass M

Moment of inertia about the x-axis	$I_x = \iiint_Q (y^2+z^2)\rho(x,y,z)\,dV$
Moment of inertia about the y-axis	$I_y = \iiint_Q (x^2+z^2)\rho(x,y,z)\,dV$
Moment of inertia about the z-axis	$I_z = \iiint_Q (x^2+y^2)\rho(x,y,z)\,dV$
Center of Mass	$M = \iiint_Q \rho(x,y,z)\,dV$ $m_{yz} = \iiint_Q x\rho(x,y,z)\,dV$ $m_{xz} = \iiint_Q y\rho(x,y,z)\,dV$ $m_{xy} = \iiint_Q z\rho(x,y,z)\,dV$ $\bar{x} = \dfrac{m_{yz}}{M}, \quad \bar{y} = \dfrac{m_{xz}}{M}, \quad \bar{z} = \dfrac{m_{xy}}{M}$