Dysk

$$dm = dI\, S = dI\, \pi r^2 \qquad \sigma = \frac{Q}{\pi R^2}$$

$$dI = \frac{dq}{dt} = \frac{\sigma \cdot r\, dr\, d\varphi}{dt} = \sigma \omega r\, dr$$

$$dm = \sigma \omega \pi r^3 dr$$

$$m = \sigma \omega \pi \int_0^R r^3 dr = \frac{Q}{\pi R^2} \omega \pi \frac{R^4}{4} = \frac{Q \omega R^2}{4}$$

Kula:

$$\rho = \frac{Q}{\frac{4}{3}\pi R^3} \qquad S = \pi r^2 = \pi r'^2 \sin^2\theta$$

$$dI = \frac{dQ}{dt} = \frac{\rho r'^2 \sin\theta\, dr\, d\theta\, d\varphi}{dt} = \rho r'^2 \omega \sin\theta\, dr'\, d\theta$$

$$dm = dI\, S = \rho \omega \pi \int_0^R \int_0^\pi r'^4 \sin^3\theta\, d\theta\, dr' =$$

$$= \left\{ \begin{array}{l} \int_0^\pi \sin\theta(1-\cos^2\theta)d\theta = -\int_1^{-1} 1-u^2\, du = \left[u - \frac{u^3}{3}\right]_{-1}^{1} = \frac{4}{3} \\ \cos\theta = u \\ -\sin\theta\, d\theta = du \end{array} \right\} =$$

$$= \frac{4}{3}\rho\omega\pi \int_0^R r'^4 dr' = \frac{4}{3}\rho\omega\pi\frac{R^5}{5} = \frac{4}{\cancel{3}} \frac{Q}{\cancel{\frac{4}{3}\pi R^3}} \omega \cancel{\pi}\cancel{R^3}\frac{R^2}{5} =$$

$$= \frac{Q\omega R^2}{5}$$

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