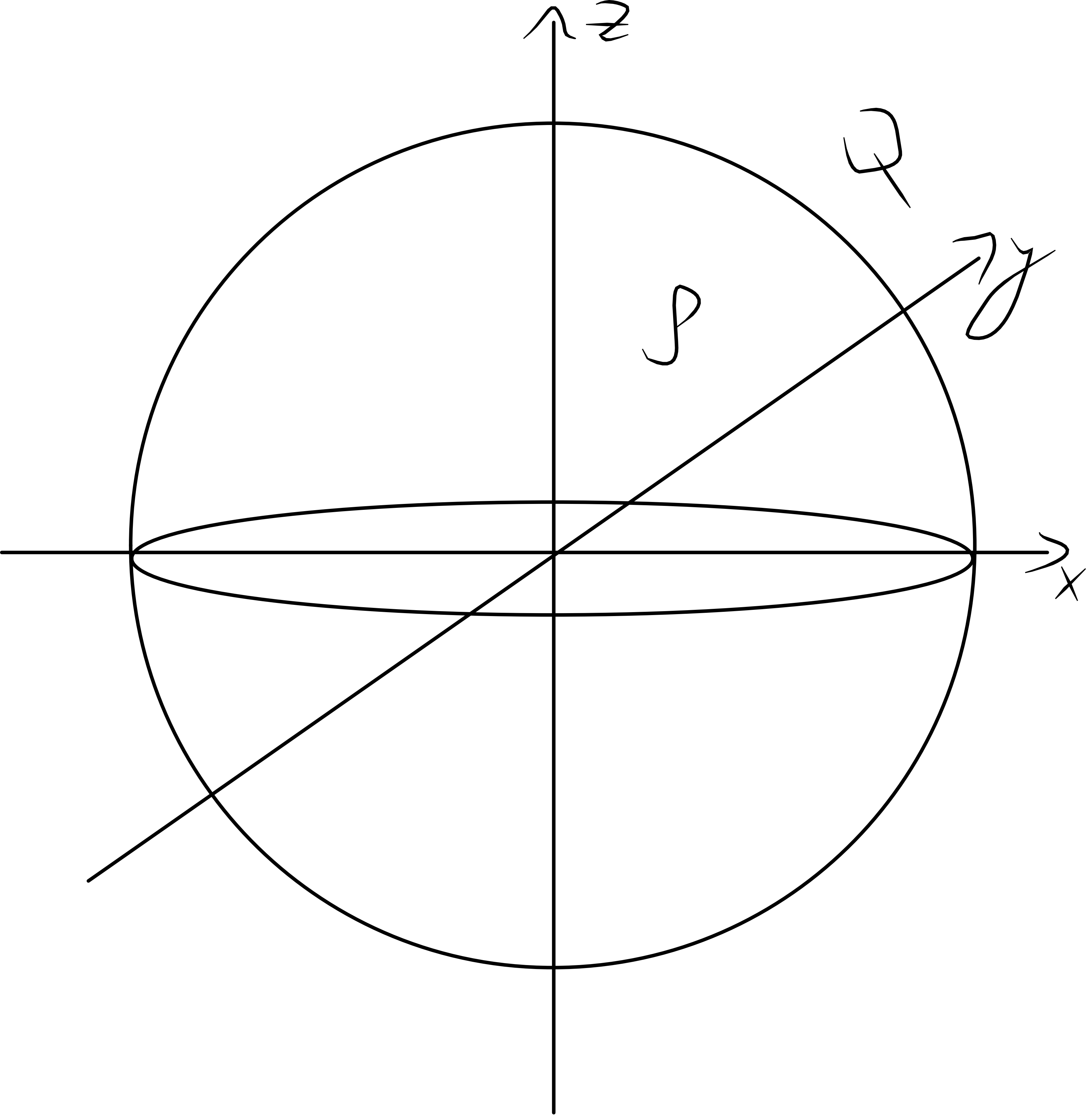

$\bar{E}$ - w środku

$$\bar{E} = \frac{Q}{4\pi \varepsilon_0 R^3}\,\bar{r}$$

$$d\bar{F} = \bar{E}\,dq = \bar{E}\rho\,dV = \frac{Q}{\frac{4}{3}\pi R^3}\,\frac{Q}{4\pi\varepsilon_0 R^3}\,\bar{r}\,dV$$

$$= \frac{3Q^2}{16\pi^2\varepsilon_0 R^6}\,\bar{r}\,dV$$

$$\begin{Bmatrix} u = \sin\theta \\ du = \cos\theta\,d\theta \end{Bmatrix}$$

z symetri przeżyje tylko F_z: $\bar{r} \to r_z = r\cos\theta$

$$F_z = \frac{3Q^2}{16\pi^2\varepsilon_0 R^6}\int_0^R\int_0^{\frac{\pi}{2}}\int_0^{2\pi} r^3\cos\theta\sin\theta\,d\varphi\,d\theta\,dr = \frac{3Q^2}{8\pi\varepsilon_0 R^6}\int_0^R\int_0^1 r^3 u\,du\,dr$$

$$= \frac{3Q^2}{16\pi\varepsilon_0 R^6}\int_0^R r^3\,dr = \frac{3Q^2}{64\pi\varepsilon_0 R^2}$$

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