H21

2 続き

(3)

$S_2 : x^2+y^2 \leqq 1 \ , \ z=1$

$\boldsymbol{n} = (0, 0, 1)$

$$\iint_{S_2} (\mathrm{rot}\, \boldsymbol{u}) \boldsymbol{n} \, dS = \iint_{S_2} z^2 \, dS$$

$$= \iint_{S_2} 1 \, dS$$

$$= \pi$$

$$\iint_{S_1} (\mathrm{rot}\, \boldsymbol{u}) \cdot \boldsymbol{n} \, dS + \iint_{S_2} (\mathrm{rot}\, \boldsymbol{u}) \cdot \boldsymbol{n} \, dS = \left(1 - \frac{\sqrt{2}}{3}\right) \pi$$