

H/6

②

(1)

$$A = (0, 0, 1) \cdot (x, 2y, 3z)$$

$$= (-2y, x, 0)$$

$$= (-2a \sin t, a \cos t, 0)$$

$$\int_c A \, dt = \int_0^{2\pi} (-2a \sin t, a \cos t, 0) \cdot (-a \sin t, a \cos t, a) \, dt$$

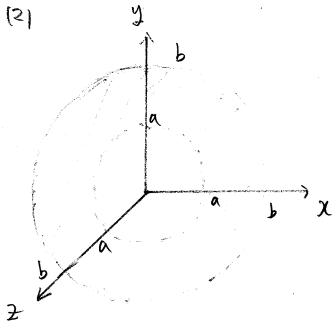
$$= \int_0^{2\pi} (2a^2 \sin^2 t + a^2 \cos^2 t) \, dt$$

$$= \int_0^{2\pi} (a^2 \sin^2 t + a^2) \, dt$$

$$= \int_0^{2\pi} \left(a^2 \frac{1 - \cos 2t}{2} + a^2 \right) \, dt$$

$$= \left[\frac{3}{2} a^2 t + \sin 2t \right]_0^{2\pi} = 3a^2 \pi$$

(2)



(3)

2重積分の定理より

$$\int_S \text{rot } A \cdot n \, dS = \int_c A \, dt$$

(2)より半径 b の球より半径 a の球の体積を引けばいい

$$\therefore \int_c A \, dt = 3b^2 \pi - 3a^2 \pi$$

$$= 3(b^2 - a^2) \pi$$