Aula 19 - 15.7/21

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- $\begin{cases} x = r\cdot\cos(\theta) \\ y = r\cdot\operatorname{sen}(\theta) \\ z = z \end{cases}$

- Região está dentro de um cilindro $x^2 + y^2 = 1$

  - $x^2 + y^2 \leq 1 \iff r^2(\cos^2(\theta) + \operatorname{sen}^2(\theta)) \leq 1 \iff 0 \leq r < 1$

  - $0 \leq z^2 \leq 4x^2 + 4y^2 \iff 0 \leq z^2 \leq 4r^2(\cos^2(\theta) + \operatorname{sen}^2(\theta) \iff 0 \leq z \leq 2r$

  - $0 \leq \theta \leq 2\pi$

- $\iiint_E x^2\,dV = \int_0^{2\pi}\int_0^{1}\int_0^{2r} (r\cdot\cos(\theta))^2 \cdot r\,dz\,dr\,d\theta$

- $\iiint_E x^2\,dV = \int_0^{2\pi}\int_0^{1}\int_0^{2r} (r\cdot\cos(\theta))^2\, r\,dz\,r\,d\theta = \int_0^{2\pi}\int_0^{1}\int_0^{2\pi} r^3\cos^2(\theta)\,dz\,dr\,d\theta \Rightarrow$

$$\iiint_E x^2\,dV = \int_0^{2\pi}\int_0^{1} 2r^4\cdot\cos^2(\theta)\,dr\,d\theta = 2\cdot\left(\frac{r^5}{5}\right)_0^1 \cdot \left(\frac{\theta + \operatorname{sen}\theta\cdot\cos(\theta)}{2}\right)_0^{2\pi} = \frac{2\pi}{5}$$

$$\therefore \iiint_E x^2\,dV = \frac{2\pi}{5}$$