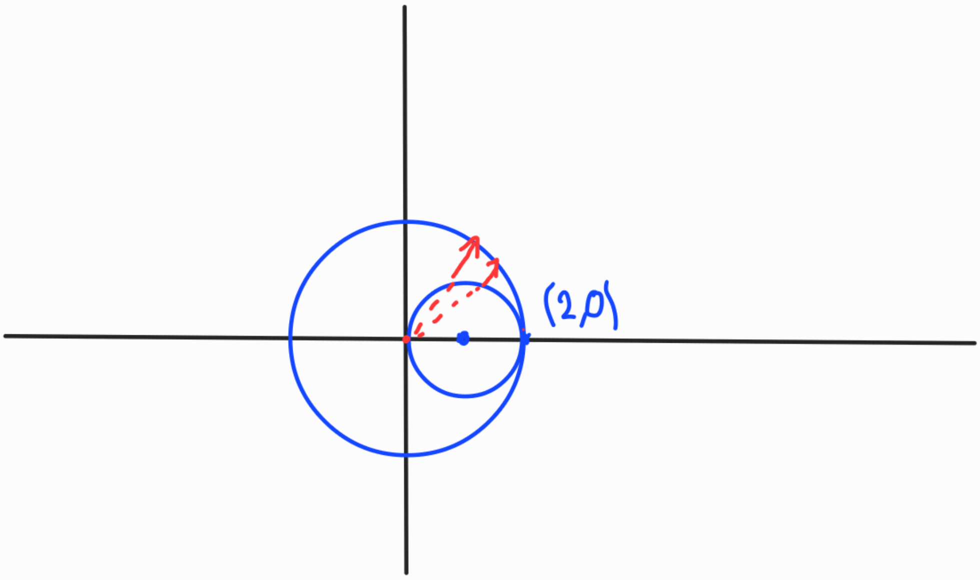
5 D :



$$\begin{cases} x = r\cos\theta \\ y = r\,\text{sen}\,\theta \end{cases}$$

$$x^2 + y^2 = 4 \Rightarrow r^2 = 4 \Rightarrow r = 2$$

$$x^2 + y^2 = 2x \Rightarrow r^2 = 2r\cos\theta \Rightarrow r = 2\cos\theta$$

$$\theta \in [0, \pi/2]$$

$$r \in [2\cos\theta, 2]$$

$$\iint_D x\, dA = \int_0^{\pi/2}\int_{2\cos\theta}^{2} r\cos\theta \cdot r \cdot dr\, d\theta =$$

$$= \int_0^{\pi/2}\int_{2\cos\theta}^{2} r^2 \cos\theta\, dr\, d\theta = \int_0^{\pi/2} \left[\frac{r^3}{3}\cos\theta\right]_{2\cos\theta}^{2} d\theta =$$

$$= \frac{8}{3}\int_0^{\pi/2} (\cos\theta - \cos^4\theta)\, d\theta$$

$$= \frac{8}{3}\left[\text{sen}\,\theta - \frac{3\theta}{8} - \frac{\text{sen}\,4\theta}{32} - \frac{\text{sen}\,2\theta}{4}\right]_0^{\pi/2} =$$

$$= \frac{8}{3}\left[\text{sen}\,\frac{\pi}{2} - \frac{3}{8}\cdot\frac{\pi}{2} - \frac{\text{sen}\,2\pi}{32} - \frac{\text{sen}\,\pi}{4}\right] =$$

$$= \frac{8}{3}\left[1 - \frac{3\pi}{16}\right] = \frac{8}{3} - \frac{\pi}{2}.$$

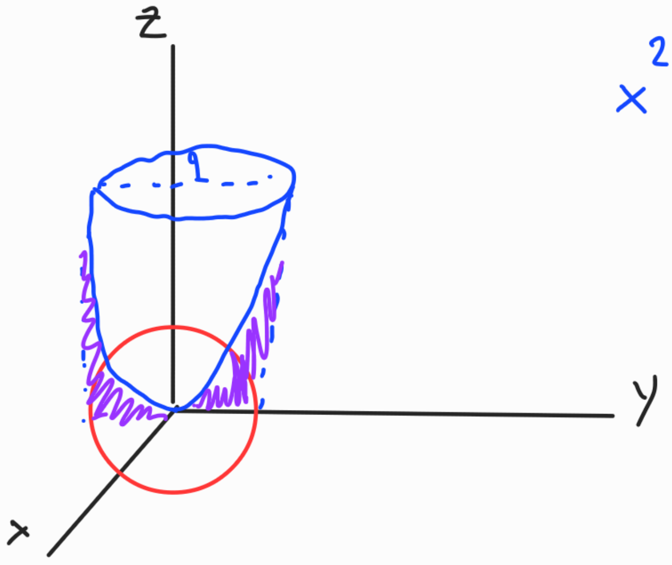
$$(\cos^2\theta)^2 = \left(\frac{1+\cos 2\theta}{2}\right)^2 = \frac{\cos^2 2\theta + 2\cos 2\theta + 1}{4}$$

$$\int \frac{\frac{1+\cos 4\theta}{2} + 2\cos 2\theta + 1}{4}\, d\theta =$$

$$= \int\left(\frac{3}{8} + \frac{\cos 4\theta}{8} + \frac{\cos 2\theta}{2}\right) d\theta =$$

$$= \frac{3\theta}{8} + \frac{\text{sen}\,4\theta}{32} + \frac{\text{sen}\,2\theta}{4}$$

7) Vol. abaixo de $z = x^2+y^2$ e acima de $x^2+y^2 \le 9$.



$$x^2 + y^2 = 9 = z$$

$$\begin{cases} x = r\cos\theta \\ y = r\,\text{sen}\,\theta \end{cases}$$

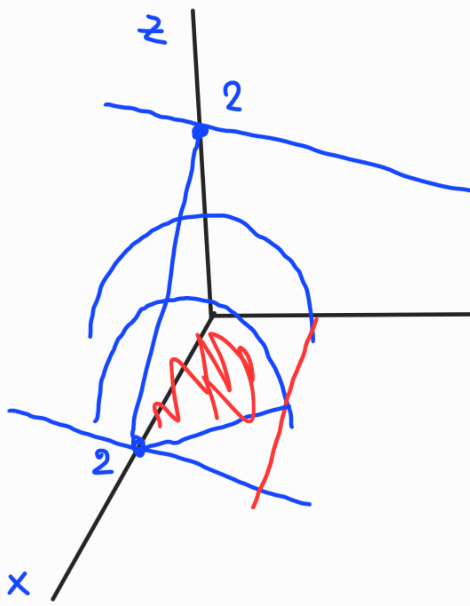
$$\{\, 0 \le r \le 3,\ 0 \le \theta \le 2\pi$$

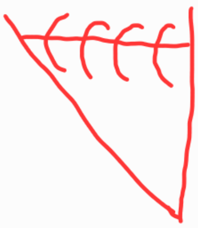
$$V = \int_0^{2\pi}\int_0^3 r^2 \cdot r \cdot dr\, d\theta = \int_0^{2\pi}\int_0^3 r^3\, dr\, d\theta =$$

$$= \int_0^{2\pi} \left[\frac{r^4}{4}\right]_0^3 d\theta = \int_0^{2\pi} \frac{3^4}{4}\, d\theta = \left[\frac{81}{4}\theta\right]_0^{2\pi} = \frac{81\pi}{2}.$$

3

$$\begin{cases} z = 1 - y^2 \\ x + z = 2 \\ x = 2 \\ z \geq 0 \end{cases}$$





$$\begin{cases} z \leq 1 - y^2 \\ x + z \geq 2 \\ x \leq 2 \\ z \geq 0 \end{cases}$$

$$2 - x \leq z \leq 1 - y^2$$

$$x + z \geq 2$$

$$x + 1 - y^2 \geq x + z \geq 2$$

$$x + 1 - y^2 \geq 2$$

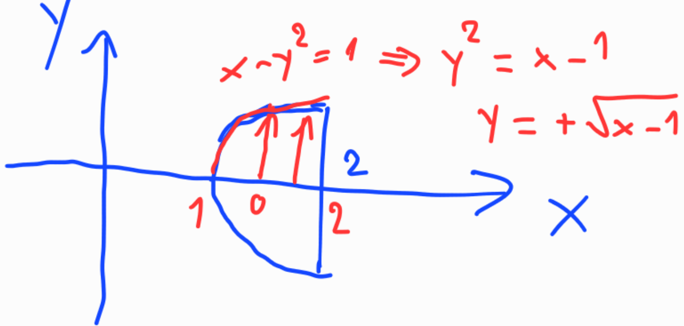
$$2 - y^2 \geq x - y^2 \geq 1$$

$$-1 \leq y \leq 1 \quad (X)$$

$$x + z = 2$$

$$z = 1 - y^2$$

$$x - y^2 = 1$$



$x - y^2 \geq 1$

$$2\int_1^2\int_0^{\sqrt{x-1}} (1 - y^2 - 2 + x)\, dy\, dx = 2\int_1^2\int_0^{\sqrt{x-1}} (x - y^2 - 1)\, dy\, dx = \ldots$$