Lunghezza di $\rho = \cos^4 \frac{\theta}{4}$ $\quad \theta \in [0, 2\pi]$

$$\boxed{\Lambda = \int_0^{2\pi} \sqrt{\dot{\rho}^2 + \rho^2 \dot{\theta}^2}\, dt} =$$

$$= \int_0^{2\pi} \sqrt{4 \cos^3 \frac{\theta}{4} \left(-\sin \frac{\theta}{4}\right) \frac{1}{4}}$$

$\rho(t)$

$\theta(t)$

$$\begin{cases} x(t) = \rho(t) \cos \theta(t) \\ y(t) = \rho(t) \sin \theta(t) \end{cases}$$

$x = \rho \cos \theta$

$y = \rho \sin \theta$

$t = \theta$

$$\begin{cases} x = \cos^4 \frac{\theta}{4} \cos \theta \\ y = \cos^4 \frac{\theta}{4} \sin \theta \end{cases}$$

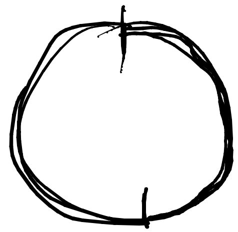
$$\begin{cases} x(t) = \cos^4 \frac{t}{4} \cos t \\ y(t) = \cos^4 \frac{t}{4} \sin t \end{cases}$$

$$\cos 2x = \underrightarrow{2\cos^2 x - 1} = \underrightarrow{1 - 2\sin^2 x}$$

$$\boxed{\Lambda = \int_0^{2\pi} \sqrt{\dot\rho^2 + \rho^2\dot\theta^2}\, dt =}$$

$$= \int_0^{2\pi} \sqrt{\Big[\underbrace{\cancel{4}\cos^3\frac{\theta}{4}\left(-\sin\frac{\theta}{4}\right)\frac{1}{\cancel{4}}}_{\dot\rho(\theta)}\Big]^2 + \underbrace{\cos^8\frac{\theta}{4}}_{\rho^2}\cdot\underbrace{1}_{\dot\theta}} = \int_0^{2\pi} \sqrt{\cos^6\frac{\theta}{4}\sin^2\frac{\theta}{4} + \cos^8\frac{\theta}{4}}\; d\theta =$$

$$= \int_0^{2\pi} \sqrt{\cos^6\frac{\theta}{4}}\; d\theta = \int_0^{2\pi} \left|\cos^3\frac{\theta}{4}\right| d\theta = -\int_{\frac{\pi}{2}}^{\frac{3}{2}\pi} \cos^3\frac{\theta}{4} + \int_{-\frac{\pi}{2}}^{\frac{\pi}{2}} \cos^3\frac{\theta}{4}$$



$\cos^{2n} x \qquad \sin^{2n} x$

$(\cos^2 x)^n \qquad (\sin^2 x)^n$

$\sin^2 x = \frac{1}{2} - \frac{1}{2}\cos 2x$

$\cos^2 x = \frac{1}{2} - \frac{1}{2}\cos 2x$

$$\cos^7 x = (1 - \sin^2 x)^3 \cos x$$

$$(1 - t^2)^3\, dt$$

$$\cos^2\frac{\theta}{4} \qquad \cos\frac{\theta}{4}$$

$$\left(1 - \sin^2\frac{\theta}{4}\right) \qquad \sin\frac{\theta}{4} = t$$

$\rho(t)$ $\qquad x(t) = \rho(t) \cos\theta(t)$

$\theta(t)$ $\qquad y(t) = \rho(t) \sin\theta(t)$

$$\dot{\rho}^2 + \rho^2 \dot{\theta}^2 + \rho^2 \sin\theta \, \dot{\varphi}^2$$

$$\dot{x} = \dot{\rho} \cos\theta + \rho\left(-(\sin\theta)\dot{\theta}\right)$$

$$\dot{y} = \dot{\rho} \sin\theta + \rho(\cos\theta)\dot{\theta}$$

$$|\dot{\gamma}(t)| = \sqrt{\dot{\rho}^2 + \rho^2 \dot{\theta}^2 + 0}$$

$$\int_T \sqrt{x^2+y^2}\; dx\,dy\,dz \qquad T = \{z>0\} \cap \{x^2+y^2 \le 9-z\}$$

Polari cilindriche

$$J = \rho$$

$$\rho^2 \le 9 - z < 9$$

$$\int_0^3 d\rho\, \rho \int_0^{9-\rho^2} dz = \int_0^3 d\rho\, \rho\,(9-\rho^2)$$

$$0 < z < 9-\rho^2$$

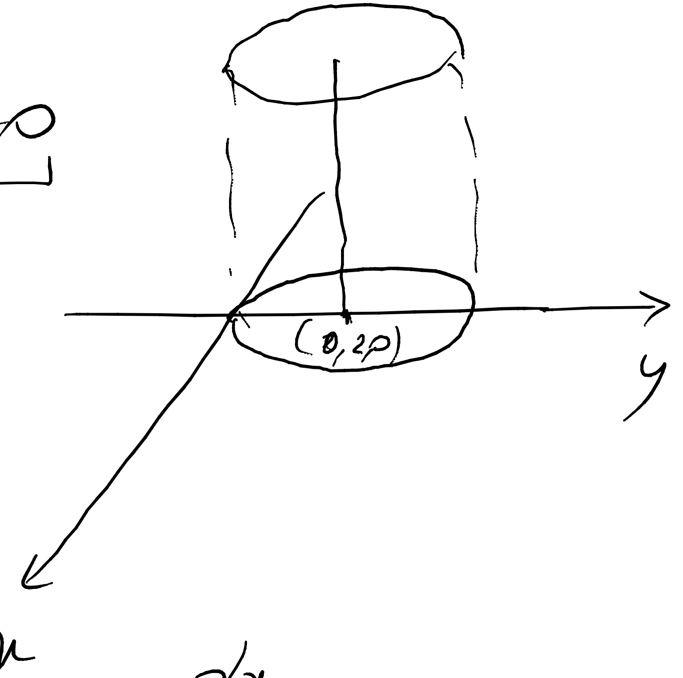
$$0 < \rho < 3$$

$$\begin{cases} x = \rho\cos\theta \\ y = \rho\sin\theta \\ z = z \end{cases} \qquad \sqrt{x^2+y^2} = \rho$$

$\boxed{\text{Area}}$ porzione di cono $\quad \underline{x^2+y^2=3z^2}, \quad \underline{z \geq 0}$

interna al cilindro $\quad \underbrace{x^2+y^2-4y=0}$

$$\underbrace{x^2+(y-2)^2 \leq 4}$$



$$z = \frac{1}{\sqrt{3}}\sqrt{x^2+y^2} = f(x,y)$$

$$z_x = \frac{1}{\sqrt{3}} \frac{\cancel{2}x}{\cancel{2}\sqrt{x^2+y^2}}$$

$$\iint\limits_{\substack{x^2+y^2-4y \leq 0 \\ \Omega}} \sqrt{1+f_x^2+f_y^2}\, dx\, dy = \iint_{\Omega} \sqrt{1+\frac{1}{3}\frac{x^2}{x^2+y^2}+\frac{1}{3}\frac{y^2}{x^2+y^2}}\, dx\, dy$$

$$= \int_{x^2+y^2-4y\le 0} \sqrt{\frac{3x^2+3y^2+x^2+y^2}{3(x^2+y^2)}}\, dx\,dy = \frac{4}{3}\int_{x^2+y^2-4y\le 0} 1\, dx\,dy =$$

cerchio
di raggio 2 area $= \pi \cdot 4$

$$= \boxed{\frac{16}{3}\pi}$$

$$\sqrt{1-\cos(x^2-y^2)}$$

C^0 composta di funz continue ~~sempre definita~~

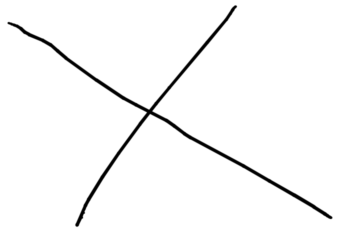
$$f_x = \lim_{h\to 0} \frac{\sqrt{1-\cos h^2} - 0}{h} = \quad (0,0)$$

$$\lim_{0} \left(\frac{1}{h} \underbrace{\sqrt{\frac{1-\cos h^2}{h^4}}}_{h^2=t\ \downarrow\ \boxed{\frac{1}{2}}} \frac{\boxed{\sqrt{h^4}}}{h^2} \right) = \lim_{0} \frac{h^2}{h} = 0$$

$$\boxed{f_y = 0}$$

$$\lim_{h,k\to 0} \frac{\sqrt{1-\cos(h^2-k^2)} - \overset{f(0,0)}{0} - \overset{\nabla f(0,0)(h,k)}{0}}{\sqrt{h^2+k^2}}$$

$$\underbrace{\sqrt{\frac{1-\cos(h^2-k^2)}{(h^2-k^2)^2}}}_{\to \frac{1}{\sqrt{2}}} \cdot \underbrace{\frac{|h^2-k^2|}{\sqrt{h^2+k^2}}}_{} \to 0 \qquad \boxed{\underline{h^2 \neq k^2}}$$



$t = h^2 - k^2$

1-omogenea, continua, con denom. mai nullo su $h^2+k^2=1$

<u>Tutti i punti interni sono d'accumulaz.</u>

I punti isolati sono di frontiera

Un punto di frontiera <u>non isolato</u> è di accumulaz.