Sia

$$I = \int_{\Sigma} (x^2+y^2)^{-3/2} \left(4(x^2+y^2)+2\right)^{-1/2} \, d\sigma$$

allora

$$I = \int_1^2 dz \int_0^{2\pi} \cancel{(\rho(\theta))^3} \left(4\rho^2(\theta)+2\right)^{-1/2} \frac{\left(3+|\mathrm{sen}(2\theta)|\right)^{1/2}}{\cancel{(\rho(\theta))^{-3}}} \, d\theta$$

$$\frac{4}{1+|\mathrm{sen}(2\theta)|}+2 = 2\,\frac{3+|\mathrm{sen}(2\theta)|}{1+|\mathrm{sen}(2\theta)|}$$

$$= \int_0^{2\pi} \frac{1}{\sqrt{2}} \sqrt{1+|\mathrm{sen}(2\theta)|} \, d\theta = \sqrt{2} \int_0^{\pi} \sqrt{1+\mathrm{sen}\,\theta} \, d\theta$$

$$\underset{t=\mathrm{tg}(\theta/2)}{=} \sqrt{2} \int_0^{+\infty} \underbrace{\sqrt{1+\frac{2t}{1+t^2}} \; \frac{2}{1+t^2}}_{= 2\,\frac{1+t}{(1+t^2)^{3/2}}} \, dt$$

D'altra parte:

$$\int \frac{t}{(1+t^2)^{3/2}} \, dt = -\frac{1}{\sqrt{1+t^2}} + c$$

integrando per parti con $f(t)=t$, $g'(t)=\frac{t}{(1+t^2)^{3/2}}$

$$\int \frac{1}{(1+t^2)^{3/2}} \, dt \overset{\pm t^2}{=} \int \frac{1}{\sqrt{1+t^2}} \, dt - \int \frac{t^2}{(1+t^2)^{3/2}} =$$

$$\int \frac{1}{\sqrt{1+t^2}} \, dt - \left(-\frac{t}{\sqrt{1+t^2}} + \int \frac{1}{\sqrt{1+t^2}} \, dt \right) = \frac{t}{\sqrt{1+t^2}} + c$$

Infine:

$$I = 2\sqrt{2} \left[\frac{t-1}{\sqrt{1+t^2}} \right]_0^{+\infty} = 2\sqrt{2} \left[1-(-1) \right]$$

$$= 4\sqrt{2}$$