Calcule a área da elipse $\frac{x^2}{a^2} + \frac{y^2}{b^2} = 1$.

Resolução:

$$\frac{A}{2} \;=\; \int_{-a}^{a} \sqrt{b^2 - b^2(\frac{x}{a})^2}\; dx \;=\; ab\int_{-1}^{1} \sqrt{1-u^2}\; du \;=\; -ab\int_{\pi}^{0} \sin^2\theta\; d\theta \;=$$

$$= \; -ab\int_{\pi}^{0} \frac{1-\cos(2\theta)}{2}\; d\theta \;=\; -\frac{ab\theta}{2}|_{\pi}^{0} + \frac{ab\sin(2\theta)}{4}|_{\pi}^{0} = ab\frac{\pi}{2}$$

$\boxed{A = ab\pi}$

$x = au,\ u = \cos\theta,\ \theta \in [0, \pi]$

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