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Trabalho 4 - Cálculo II

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A curva apresenta simetria em relação aos eixos x e o y, portanto, a área calculada será apenas a do 1º quadrante e multiplicada por 4.

no ponto (0,4): no ponto (2,0) temos:

$$\begin{matrix} 0 = 2\cos t \\ 4 = 4 \operatorname{sen} t \end{matrix} > t = \frac{\pi}{2} \qquad \begin{matrix} 2 = 2\cos t \\ 0 = 4 \operatorname{sen} t \end{matrix} > t = 0$$

$$A_1 = 4\int_{\pi/2}^{0} 4\operatorname{sen}t(-2\operatorname{sen}t)\,dt = \int_{\pi/2}^{0} -32\operatorname{sen}^2 t\,dt = 32\int_0^{\pi/2} \operatorname{sen}^2 t\,dt$$

$$A_1 = 32\int_0^{\pi/2} \frac{1-\cos 2t}{2}\,dt = 16\int_0^{\pi/2} 1-\cos 2t\,dt = 16\left(t - \frac{\operatorname{sen} 2t}{2}\right)\Big|_0^{\frac{\pi}{2}}$$

$$A_1 = 16\left(\frac{\pi}{2} - \frac{\operatorname{sen}\pi}{2}\right) = 16\left(\frac{\pi}{2} - \frac{0}{2}\right) = 8\pi \text{ u.a.}$$

Agora, fazendo a área da menor elipse:

no ponto (0,1): no ponto (2,0):

$$\begin{matrix} 0 = 2\cos t \\ 1 = \operatorname{sen} t \end{matrix} > t = \frac{\pi}{2} \qquad \begin{matrix} 2 = 2\cos t \\ 0 = \operatorname{sen} t \end{matrix} > t = 0$$

$$A_2 = 4\int_{\pi/2}^{0} \operatorname{sen}t(-2\operatorname{sen}t)\,dt = \int_{\pi/2}^{0} -8\operatorname{sen}^2 t\,dt = 8\int_0^{\pi/2} \operatorname{sen}^2 t\,dt$$

$$A_2 = 8\int_0^{\pi/2} \frac{1-\cos 2t}{2}\,dt = 4\int_0^{\pi/2} 1-\cos 2t\,dt = 4\left(t - \frac{\operatorname{sen} 2t}{2}\right)\Big|_0^{\pi/2}$$

$$A_2 = 4\left(\frac{\pi}{2} - \frac{\operatorname{sen}\pi}{2}\right) = 2\pi \text{ u.a} \qquad A_T = 8\pi - 2\pi = 6\pi \text{ u.a}$$

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Portanto a área entre as elipses é 6π u.a //