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MATRÍCULA: 422029

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$$f(x,y) = 0,2\,(x^2 - y^2)$$

$$\int_U f(x,y)\,dx \quad , \quad U = \left\{(x,y) \in \frac{x^2}{1600} + \frac{y^2}{400} \leq 1\right\}$$

$$\downarrow$$

$$\frac{x^2}{40^2} + \frac{y^2}{20^2} \leq 1$$

Elipse.

$$\begin{pmatrix} x \\ y \end{pmatrix} = \begin{pmatrix} \alpha 40\cos(\beta) \\ \alpha 20\,\mathrm{sen}(\beta) \end{pmatrix} \rightarrow \text{colocando em coordenadas polares para elipse.}$$

$$J_1 = \begin{bmatrix} \frac{\partial x}{\partial \alpha} & \frac{\partial x}{\partial \beta} \\ \frac{\partial y}{\partial \alpha} & \frac{\partial y}{\partial \beta} \end{bmatrix} \rightarrow |J_1| = \begin{vmatrix} 40\cos(\beta) & -\alpha 40\,\mathrm{sen}(\beta) \\ 20\,\mathrm{sen}(\beta) & \alpha 20\cos(\beta) \end{vmatrix}$$

$$|J_1| = \alpha 40.20.\cos^2(\beta) + \alpha.40.20.\mathrm{sen}^2(\beta)$$

$$= 800\alpha$$

$$0,2\int_0^{2\pi}\int_0^1 (\alpha^2 40^2\cos^2\beta - \alpha^2 20^2\mathrm{sen}^2\beta)\,800\alpha\,d\alpha\,d\beta$$

Colocando em coordenadas de Gauss-Legendre.

$$\alpha(\gamma,\theta) = \left(\frac{1+0}{2} + \frac{1-0}{2}\gamma\right) = \frac{1}{2}(1+\gamma)$$

$$\beta(\gamma,\theta) = \left(\frac{2\pi+0}{2} + \frac{2\pi-0}{2}\theta\right) = \pi(1+\theta)$$

$$J_2 = \begin{bmatrix} \frac{\partial\alpha}{\partial\gamma} & \frac{\partial\alpha}{\partial\theta} \\ \frac{\partial\beta}{\partial\gamma} & \frac{\partial\beta}{\partial\theta} \end{bmatrix} \rightarrow |J_2| = \begin{vmatrix} \frac{1}{2} & 0 \\ 0 & \pi \end{vmatrix} = \frac{\pi}{2}$$

$$0{,}2\int_{-1}^{1}\int_{-1}^{1}\left(x(\alpha(\gamma,\theta),\beta(\gamma,\theta))^2 - y(\alpha(\gamma,\theta),\beta(\gamma,\theta))^2\right) 800\,\frac{\pi}{2}\,\alpha(\gamma,\theta)\,d\gamma\,d\theta$$

(γ , θ)	$w_i w_j$	g(@)	$w_i w_j$*g(@)	*80π
(-√0.6 , -√0.6)	25/81	1.079251	0.333102	83.717729
(0, -√0.6)	40/81	94.241373	46.538950	11696.513649
(√0.6 , -√0.6)	25/81	526.672440	162.553222	40854.079961
(-√0.6 , 0)	40/81	2.290398	1.131061	284.266583
(0, 0)	64/81	200	158.024691	39715.936090
(√0.6 , 0)	40/81	1117.709602	551.955360	138721.509836
(-√0.6 , √0.6)	25/81	1.079251	0.333102	83.717705
(0, √0.6)	40/81	94.241347	46.538937	11696.510363
(√0.6 , √0.6)	25/81	526.672292	162.553176	40854.068484
				283990.320400

$\alpha(\gamma , \theta)*(x(\alpha(\gamma , \theta), \beta(\gamma , \theta))^2 - y(\alpha(\gamma , \theta), \beta(\gamma , \theta))^2) = g(@)$

SOMA: 283990.320400