(16) (II) $\min f(x) = -4x_1x_2$

$h(x_1, x_2): \left(\frac{x_1}{2}\right)^2 + x_2^2 - 4 = 0$

$x_1, x_2 > 0$

$$\vec{\nabla}_f + \sum_{i=1}^{m} \lambda_i \vec{\nabla}_g + \sum_{j=m+1}^{m+n} \lambda_j \cdot \vec{\nabla}_h = 0$$

$$\Downarrow$$

$$\nabla_f = \begin{bmatrix} -4x_2 \\ -4x_1 \end{bmatrix} \qquad \vec{\nabla}_g = \begin{bmatrix} \frac{x_1}{2} \\ 2x_2 \end{bmatrix} \Rightarrow \begin{cases} \frac{\lambda_1}{2}x_1 - 4x_2 = 0 & \text{(I)} \\ -4x_1 + 2\lambda_1 x_2 = 0 & \text{(II)} \\ \frac{x_1^2}{4} + x_2^2 - 4 = 0 & \text{(III)} \end{cases}$$

Em (I)

$x_2 = \frac{\lambda_1 x_1}{8} \Rightarrow$ Substituindo em (II)...

(II) $-4x_1 + 2 \cdot \left(\frac{\lambda_1^2 x_1}{8}\right) = 0$ ∴

$\lambda_1^2 = 16$

$\lambda_1 = \pm 4$

$\Rightarrow$

(A)

Substituindo λ_1 em (I) (II) (III) $\therefore$

$$
\begin{cases}
-4x_2 + 2x_1 = 0 & \text{(I)} \\
-4x_1 + 8x_2 = 0 & \text{(II)} \\
\dfrac{x_1^2}{4} + x_2^2 - 4 = 0 & \text{(III)}
\end{cases}
$$

$$-2x_1 + 4x_2 \div 2 = 0$$

$$x_1 = 2x_2$$

Substituindo x_1 em (III)

$$\frac{2x_2^2}{4} + x_2^2 - 4 = 0$$

$x_2 = \pm\sqrt{2}$ $\therefore$ $x_1 = 2\sqrt{2}$

Área $= 4 \cdot \sqrt{2} \cdot 2\sqrt{2} = 16$