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$$f(x) = x^2 + 12xy + 2y^2 \quad ; \quad 4x^2 + y^2 = 25$$

$$g(x, y) = 4x^2 + y^2 - 25$$

$$\begin{cases} f_x = \lambda g_x \\ f_y = \lambda g_y \end{cases}$$

$$\begin{aligned} f_x &= 2x + 12y \\ f_y &= 4y + 12x \end{aligned}$$

$$\begin{aligned} g_x &= 8x \\ g_y &= 2y \end{aligned}$$

$$\begin{cases} 2x + 12y = \lambda(8x) \\ 4y + 12x = \lambda(2y) \end{cases} \Rightarrow \frac{2x + 12y}{4x} = \lambda \quad ; \quad \frac{4y + 12x}{2y} = \lambda$$

$$\Rightarrow \frac{2x + 12y}{4x} = \frac{4y + 12x}{y}$$

$$y(2x + 12y) = 4x(4y + 12x)$$

$$2xy + 12y^2 = 16xy + 48x^2$$

$$48x^2 + 14xy - 12y^2 = 0$$

Resolver el sistema

$$\begin{cases} 48x^2 + 14xy - 12y^2 = 0 \\ 4x^2 + y^2 = 25 \end{cases}$$

$$\begin{cases} 48x^2 + 14xy - 12y^2 = 0 & (1) \\ 4x^2 + y^2 = 25 & (2) \end{cases}$$

De (2) despejamos y y y^2 y lo metemos en (1)

$$\underline{y^2 = 25 - 4x^2} \quad \underline{y = \pm \sqrt{25 - 4x^2}}$$

$$48x^2 + 14x \cdot (\sqrt{25 - 4x^2}) - 12 \cdot (25 - 4x^2) = 0$$

$$x_1 = -2 \quad x_2 = \frac{3}{2}$$

$$48x^2 + 14x \cdot (-\sqrt{25 - 4x^2}) - 12 \cdot (25 - 4x^2) = 0$$

$$x_1 = 2 \quad x_2 = -\frac{3}{2}$$

$$y = -\sqrt{25 - 4 \cdot (2)^2} = -3$$

$$y = \sqrt{25 - 4 \cdot (-2)^2} = 3$$

$$y = \sqrt{25 - 4 \cdot \left(\frac{3}{2}\right)^2} = 4$$

$$y = -\sqrt{25 - 4 \cdot \left(-\frac{3}{2}\right)^2} = -4$$

$$(2, -3), (-2, 3), \left(\frac{3}{2}, 4\right), \left(-\frac{3}{2}, -4\right)$$

$$f(2, -3) = -50$$

$$f(-2, 3) = -50$$

$$\left. \begin{array}{l} f\left(\frac{3}{2}, 4\right) = 106,25 \\ f\left(-\frac{3}{2}, -4\right) = 106,25 \end{array} \right\} \text{máx}$$

Máximos	$\left(\frac{3}{2}, 4\right), \left(-\frac{3}{2}, -4\right)$
Mínimos	$(2, -3), (-2, 3)$

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