

3) a) $f(x, y) = x^3 + y^3 - 3xy$

$$f_x = 3x^2 - 3y$$

$$f_y = 3y^2 - 3x$$

$$f_{xx} = 6x$$

$$f_{yx} = -3$$

$$f_{xy} = -3$$

$$f_{yy} = 6y$$

$$\bullet 3x^2 - 3y = 0$$

$$\bullet 3y^2 - 3x = 0$$

$$3x^2 = 3y$$

$$3x^2 - 3x = 0$$

$$x^2 = y$$

$$x_1 = 0 \quad x_2 = 1$$

$$y_1 = 0 \quad y_2 = 1$$

$$\text{PC} = (0, 0) \text{ y } (1, 1)$$

$$D = \begin{bmatrix} f_{xx} & f_{xy} \\ f_{yx} & f_{yy} \end{bmatrix} = f_{xx} \cdot f_{yy} - f_{xy} \cdot f_{yx}$$

$$D_1 = (6 \cdot 0) \cdot (6 \cdot 0) - (-3) \cdot (-3)$$

$$D_1 = -9$$

$$D_2 = (6 \cdot 1) \cdot (6 \cdot 1) - (-3) \cdot (-3)$$

$$= 36 - 9$$

$$D_2 = 27$$

$$f_{xx}(P_1) = 6 \cdot 0$$

$$f_{xx}(0) = 0$$

$$f_{yy}(1) = 6 \cdot 1$$

$$f_{yy}(1) = 6$$

Rta: \bullet El punto $(0, 0)$ es punto critico y es punto de silla

\bullet El punto $(1, 1)$ es punto critico y es minimo local



3) b) El volumen del solido

$$Z = 4 - y^2$$

$$\cdot 0 \leq x \leq 3$$

$$\cdot 0 \leq y \leq 2$$

$$\begin{aligned} & \int_0^2 \left(\int_0^3 4 - y^2 \, dx \right) dy = \\ &= \int_0^2 4x - y^2 x \Big|_0^3 dy \\ &= \int_0^2 (12 - 3y^2) - (4 \cdot 0 - 0 \cdot y^2) dy \\ &= 12y - \frac{3y^3}{3} \Big|_0^2 \\ &= (12 \cdot 2 - 2^3) - (12 \cdot 0 - 0^3) \\ &= 16 \end{aligned}$$

Rta = el volumen del solido es 16

