

$$8. F(x,y) = \underbrace{12x^3 y^3}_{M} \vec{i} + \underbrace{(9x^4 y^2 - 1)}_{N} \vec{j}$$

$$f_x \qquad \qquad \qquad f_y$$

$P(0,0) \rightarrow Q(2,3)$

$$\frac{\partial M}{\partial y} = 36x^3 y^2$$

$$\frac{\partial N}{\partial x} = 36x^3 y^2 \quad \leftarrow \text{YES}$$

$$f = \int (12x^3 y^3) dx$$

$$= 12 \cdot \frac{1}{4} x^4 y^3$$

$$= \underline{3x^4 y^3}$$

$$f = \int (9x^4 y^2 - 1) dy$$

$$= 9x^4 \cdot \frac{1}{3} y^3 - y$$

$$= \underline{3x^4 y^3 - y}$$

$$f(x,y) = 3x^4 y^3 - y$$

$\begin{matrix} x & y \\ (2, & 3) \end{matrix}$

$\begin{matrix} x & y \\ (0, & 0) \end{matrix}$

$$= 3(2)^4 (3)^3 - 3 - (3(0)^4 (0)^3 - 0)$$

$$= \textcircled{1293}$$