

Mathematics II – Examples

II. Differential Calculus of Several Variables

II.4. Total differential and tangent plane

Notation: let us have a function $z = f(x, y)$. Then
the (total) differential of the function f in the point $A = [x_0, y_0]$:

$$df(A) = \frac{\partial f}{\partial x}(A) \cdot (x - x_0) + \frac{\partial f}{\partial y}(A) \cdot (y - y_0)$$

Denote $dx = x - x_0$, $dy = y - y_0$. Then

$$df(A) = \frac{\partial f}{\partial x}(A) \cdot dx + \frac{\partial f}{\partial y}(A) \cdot dy$$

Example 91: Let $f(x, y) = \frac{y}{x} - \frac{x}{y}$.

- a) Determine and sketch domains, where the function f is differentiable.
- b) Write the differential of f in the point $A = [x_0, y_0]$.