

Per i punti del tipo $(0, \gamma_0)$:

$$\frac{f(x, \gamma) - f(0, \gamma_0) + \frac{\gamma_0^2}{2} x - (\gamma - \gamma_0)}{\sqrt{x^2 + (\gamma - \gamma_0)^2}} =$$

$$\frac{\gamma \left[\frac{\sin(xy)}{xy} - 1 \right] + \frac{\gamma_0^2}{2} x}{\sqrt{x^2 + (\gamma - \gamma_0)^2}} =$$

$$\frac{\frac{\gamma}{xy} \left[-\frac{(xy)^2}{2} + o((xy)^2) \right]}{\sqrt{x^2 + (\gamma - \gamma_0)^2}} + \frac{x \gamma_0^2}{2} =$$

$$= \frac{-x (\gamma^2 - \gamma_0^2)}{2 \sqrt{x^2 + (\gamma - \gamma_0)^2}} + \frac{o(xy^2)}{\sqrt{x^2 + (\gamma - \gamma_0)^2}}$$

$$\underbrace{|\dots| \leq \frac{|\gamma + \gamma_0|}{2}}_{|x||\gamma - \gamma_0| = o(1)} \frac{|x||\gamma - \gamma_0|}{\sqrt{x^2 + |\gamma - \gamma_0|^2}} = o(1) \quad \parallel \quad o(1)$$

Quindi, f è differenziabile ovunque.