Problem: $x=0$ $y=0$

Expand:- $e^x \log(1+y)$ at $(0,0)$ using Taylor Series of order 3.

$$f(x,y) \approx f(0,0) + \frac{1}{1!}\left[f_x(0,0)\,x + f_y(0,0)\,y\right] + \frac{1}{2!}\left[f_{xx}(0,0)x^2 + 2f_{xy}(0,0)xy + f_{yy}(0,0)\,y^2\right] + \frac{1}{3!}\left\{f_{xxx}(0,0)\,x^3 + 3f_{xxy}(0,0)\,x^2y + f_{xyy}(0,0)\right.$$

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$$f_x(x,y) = \frac{\partial}{\partial x}\left[f(x,y)\right]$$

$$= \frac{\partial}{\partial x}\left[e^x \cdot \log(1+y)\right]$$

$$= e^x \cdot \log(1+y)$$

$$f_x(\underset{x}{0},\underset{y}{0}) = e^{(0)} \cdot \log(1+0)$$

$$= 1 \cdot 0$$

$$= 0$$

$$f_{xxy} = \frac{\partial}{\partial x}\left[\frac{\partial}{\partial x}\left[\frac{\partial}{\partial y} f(x,y)\right]\right]$$

$$= \frac{\partial}{\partial x}\left[\frac{\partial}{\partial x}\left[\frac{\partial}{\partial y}\left(e^{x} \cdot \log(1+y)\right)\right]\right]$$

$$= \frac{\partial}{\partial x}\left[\frac{\partial}{\partial x}\left[e^{x} \cdot \frac{1}{1+y}\right]\right]$$

$$= \frac{\partial}{\partial x}\left(e^{x} \cdot \frac{1}{1+y}\right)$$

$$\boxed{f_{xxy}(x,y) = e^{x} \cdot \frac{1}{1+y}}$$

$$f_{xxy}(0,0) = e^{(0)} \cdot \frac{1}{1+0}$$

$$= 1 \cdot 1$$

$$= 1$$