16.39 [1G4] Are the following functions differentiable in $(0,0)$?

$$f_1(x,y) = \begin{cases} x + y & \text{if } x > 0 \\ x + ye^{-x^2} & \text{if } x \leq 0 \end{cases}, \qquad f_2(x,y) = \sqrt{x^2 + y^2}$$

$$f_3(x,y) = (\arctan(y+1))^{x+1}, \quad f_4(x,y) = \max\{x^2, y^2\} .$$

Solution 1. [1G5]