

Quiz # 15 - Solution

7.1,7.2

Math 142.518

Given the function $f(x, y) = e^{xy} \ln y$

1. [5 pts] Find $f_x(1, 2) = \frac{\partial f}{\partial x}(1, 2)$.

Solution:

$$f_x = \frac{\partial f}{\partial x} = ye^{xy} \ln y$$

$$f_x(1, 2) = 2e^2 \ln 2$$

2. [5 pts] Find $f_y(1, 2) = \frac{\partial f}{\partial y}(1, 2)$.

Solution:

$$f_y = \frac{\partial f}{\partial y} = e^{xy} \frac{1}{y} + xe^{xy} \ln y$$

$$f_y = (1, 2) = e^2 \frac{1}{2} + e^2 \ln 2 = e^2 \left(\frac{1}{2} + \ln 2 \right)$$

3. [5 pts] Find $f_{xy}(1, 2) = \frac{\partial^2 f}{\partial x \partial y}(1, 2)$.

Solution:

$$f_{xy} = \frac{\partial^2 f}{\partial x \partial y} = \frac{\partial}{\partial x} \left(\frac{\partial f}{\partial y} \right) = \frac{\partial}{\partial x} \left(e^{xy} \frac{1}{y} + xe^{xy} \ln y \right)$$

$$= ye^{xy} \frac{1}{y} + x \ln y \frac{\partial}{\partial x} (e^{xy}) + e^{xy} \ln y$$

$$= ye^{xy} \frac{1}{y} + xy \ln y e^{xy} + e^{xy} \ln y$$

$$f_{xy}(1, 2) = e^2 + 2 \ln 2 e^2 + e^2 \ln 2 = e^2 (1 + 3 \ln 2)$$