MA 16020 — Quiz 8 **Friday, November 14, 2025**

Name: ______________________________ Date: ____________

Instructions. Show all work with clear, logical steps. No work or hard-to-follow work will lose points. Scientific calculators are allowed. **2** points for name/date

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Problem 1. (2 points each) Given

$$f_x(x,y) = 8xy + \frac{6}{x}, \quad f_y(x,y) = 4x^2 + \frac{6}{y},$$

find f_{xx}, f_{yy}, and f_{xy}.

Solution:

Differentiate f_x with respect to x to get f_{xx}:

$$f_{xx}(x,y) = \frac{\partial}{\partial x}\left(8xy + \frac{6}{x}\right) = 8y - \frac{6}{x^2}.$$

Differentiate f_y with respect to y to get f_{yy}:

$$f_{yy}(x,y) = \frac{\partial}{\partial y}\left(4x^2 + \frac{6}{y}\right) = -\frac{6}{y^2}.$$

Differentiate f_x with respect to y (or f_y with respect to x) to get the mixed partial:

$$f_{xy}(x,y) = \frac{\partial}{\partial y}\left(8xy + \frac{6}{x}\right) = 8x.$$

(As a check, $\frac{\partial}{\partial x}(4x^2 + \frac{6}{y}) = 8x$ as well, so $f_{xy} = f_{yx} = 8x$.)

Answer: $f_{xx} = 8y - \frac{6}{x^2}, \quad f_{yy} = -\frac{6}{y^2}, \quad f_{xy} = 8x.$

Problem 2. (2 points) If a function $z = f(x,y)$ satisfies

$$f_{xy} = 13x^2 \sin{(xy)} e^{x+y},$$

What is f_{yx}?

Solution:

If the second partial derivatives are continuous (Clairaut's theorem / equality of mixed partials), then

$$f_{yx}(x,y) = f_{xy}(x,y) = 13x^2 \sin(xy) e^{x+y}.$$

Answer: $f_{yx} = 13x^2 \sin(xy) e^{x+y}.$