Instructions. Show all work, with clear logical steps. No work or hard-to-follow work will lose points.

Problem 1. (5 points) 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.

$$f_{xx} = \frac{\partial}{\partial x}\left(8xy + \frac{6}{x}\right) = 8y - \frac{6}{x^2}$$
$$f_{xy} = \frac{\partial}{\partial y}\left(8xy + \frac{6}{x}\right) = 8x$$
$$f_{yy} = \frac{\partial}{\partial y}\left(4x^2 + \frac{6}{y}\right) = -\frac{6}{y^2}$$

□

Problem 2. (3 points) A function $z = f(x,y)$ satisfies

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

What is f_{yx}?

Solution. Recall that $f_{xy} = f_{yx}$ (Clairaut's Theorem). So $f_{yx} = 13x^2 \sin(xy) e^{x+y}$.

□

Problem 3. (2 points) Give any comments about exam 3 and/or the course in general.