

Worksheet for September 12

Problems marked with an asterisk are to be placed in your math diary.

(1.*) Write $F(x, y) = (3x^2 + y, 6xy)$. Use the limit definition to show that $F(x, y)$ is differentiable at $(-1, 2)$.

(2*.) Calculate the derivative matrices of the following functions at the indicated points:

- (i) $f(x, y) = e^{x^2+y^2}$ at $(3, 3)$.
- (ii) $F(x, y) = (3x^2 + y, 6xy)$ at $(-1, 2)$.
- (iii) $F(x, y, z, w) = (x, y, z, w)$ at (a, b, c, d) .

(3.) Find the critical points for the following functions:

- (i) $f(x, y) = x^2 + y^3 - 6xy + 3x + 6y$ (*)
- (ii) $f(x, y) = \cos(x) \sin(y)$.
- (iii) $f(x, y) = xy + \frac{x}{y} + \frac{1}{x}$.(*)
- (iv) $2x - 3y + \ln(xy)$