

Problem 1

Find the derivative of $f(x, y) = x^2 + 3xy + y^2$ in the direction of $v = 2i + j$.

Problem 2

Define $f(x, y) = x^2 - y^2$. Sketch the level curve containing the point $(0, 1)$. Compute ∇f . Plot the tangent line and ∇f on the level curve at this point.

Problem 3

Let $f(x, y) = x^2y + e^{xy} \sin(y)$. At the point $(1, 0)$, in what direction does f increase most rapidly? Find the derivative of f in this direction.

Problem 4

Let $f(x, y) = \ln(x^2 + y^2 - 1) + y + 6z$. At the point $(1, 1, 0)$, find the direction in which f increases most rapidly. Then find the derivative of f in that direction.

Problem 5

Let $f(x, y) = xy + y^2$. Find a direction, u , such that $(D_u f)|_{(3,2)} = 0$. In what direction does f **decrease** most rapidly? Find the derivative of f in this direction.