Unit 2: Derivatives
Part 1

Bionic Who

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1 Problem 1

Consider the function $z = f(x, y) = x^2 + y^2$.

(a) Plot the level curves corresponding to $z = 1, 4, 9$.

(b) Pick three points on each level curve and sketch the gradient vector ∇f at those points.

(c) Construct a 3D surface plot of the function $z = f(x, y)$.

[Insert images of the plots here]

2 Problem 2

For the function $w = g(x, y, z) = x^2 - y^2 + z^2$,

(a) Plot the level surface $w = 0$.

(b) Plot the level surface $w = 4$.

3 Problem 3

Consider the function $z = f(x, y) = \sin(x)\cos(y)$.

(a) Plot the level curves corresponding to $z = 0, \frac{1}{2}, 1$.

(b) Construct a 3D surface plot of the function $z = f(x, y)$.

4 Problem 4

For the function $w = g(x, y, z) = x^2 + y^2 - z^2$,

(a) Plot the level surface $w = 1$.

(b) Plot the level surface $w = -1$.