Approximation and Tangent Plane Problems

1. Approximate the value of the following functions at the given points

a. \( f(x, y) = \frac{x}{y} + \frac{y}{x} \) at (2.1, .9)

b. \( f(x, y, z) = \frac{xyz}{x+y+z} \) at (1.1,1.8,3.2)

2. Find the tangent plane to the following surfaces at the given points.

a. \( z = \frac{xy}{x^2+y^2} \) at (1,2, \( \frac{2}{5} \))

b. \( z = xy^2 \) at (1,1)

Min/Max Problems

Find the maximum and minimum values of the given \( f \) over the given regions.

b. \( f(x, y) = x^2 + xy + y^2 \) over the region \(|x| \leq 1, |y| \leq 1\)

c. \( f(x, y) = xy^2 e^{-\frac{(x^2+y^2)}{2}} \) over \( R^2 \)