

6. [10 points] Suppose  $g(x, y) = x + \ln(5x^2 - 4y^2)$ .

- a. [4 points] Find an equation for the tangent plane to the surface given by the equation  $z = g(x, y)$  at the point  $(1, 1, 1)$ .

*Solution:* Since  $g_x(x, y) = 1 + \frac{10x}{5x^2 - 4y}$  and  $g_y(x, y) = \frac{-8y}{5x^2 - 4y}$  we have  $g_x(1, 1) = 11$  and  $g_y(1, 1) = -8$ . The equation of the tangent plane is

$$z - 1 = g_x(1, 1)(x - 1) + g_y(1, 1)(y - 1) = 11(x - 1) - 8(y - 1).$$

Bringing all terms to one side, we arrive at:

$$0 = 11x - 8y - z - 2.$$

- b. [4 points] Find the linearization  $L_g(x, y)$  of the function  $g(x, y)$  at the point  $(1, 1)$ .

*Solution:*

$$L_g(x, y) = 11x - 8y - 2.$$

- c. [2 points] Use the linear approximation  $L_g(x, y)$  to estimate  $g(1.1, 1.1)$ .



