Name:

Write your solution on the exam sheet. Show some work and justify your answer. Do not just give the correct answer. You have 15 minutes. Good luck!

1. Let

\[ f(x, y) = \tan^{-1}(2x + 3y) \]

and let \((a, b) = (1, 0)\). Find the partial derivatives \(f_x(1, 0)\) and \(f_y(1, 0)\) and find the linearization \(L(x, y)\) of \(f\) at \((1, 0)\).

Solution: In general \(f_x = \frac{2}{1+(2x+3y)^2}\) and \(f_y = \frac{3}{1+(2x+3y)^2}\). At \((1, 0)\) we have \(f_x(1, 0) = \frac{2}{5}\) and \(f_y(1, 0) = \frac{3}{5}\). The linearization is

\[ L(x, y) = \tan^{-1}(1/2) + \frac{2}{5}(x - 1) + \frac{3}{5}(y). \]