

Brief solutions to selected problems in homework week 8

1. Problem 2:

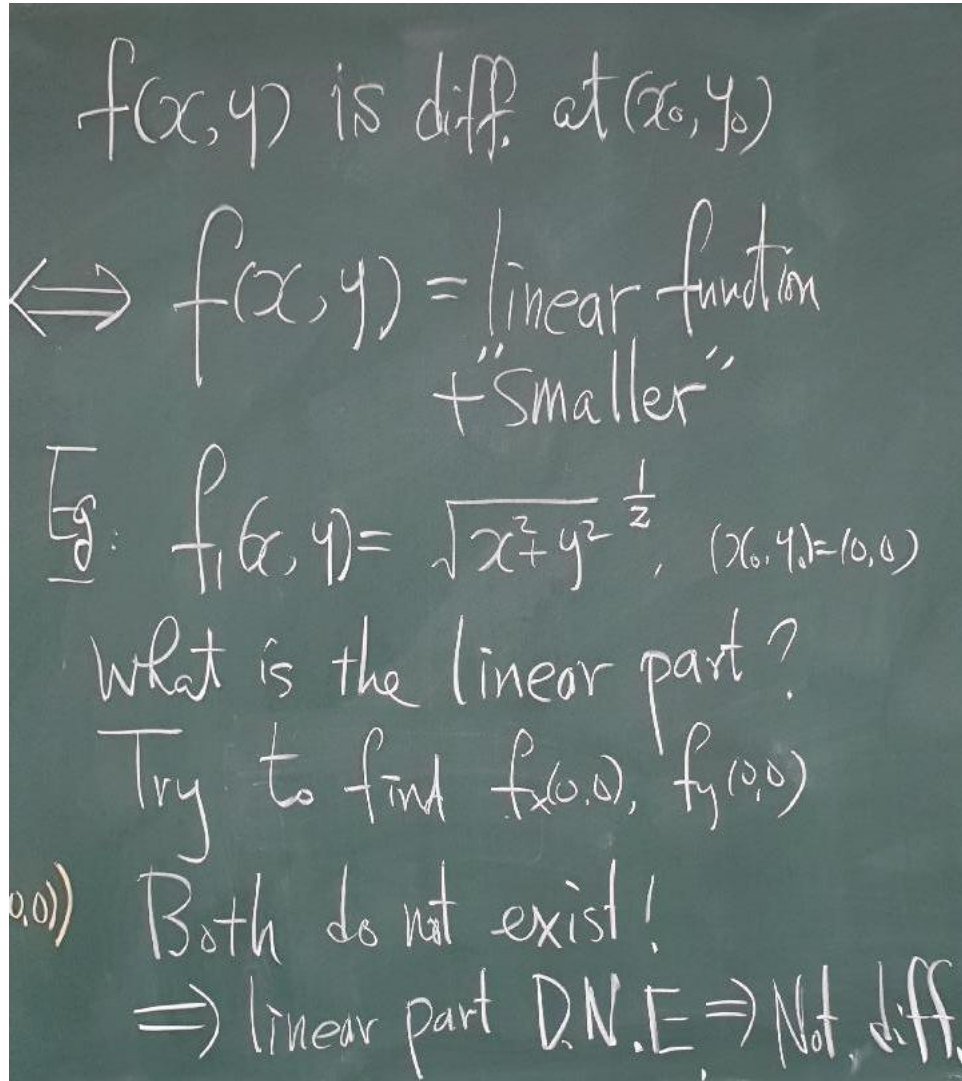


Figure 1: Problem 2

Eg 2. $f_2(x, y) = \underbrace{2x + 3y + 4}_{\text{linear}} + \underbrace{\sqrt{x^2 + y^2}}_{\text{error}}^{\frac{3}{2}}$

diff. $\Leftrightarrow \lim_{(x, y) \rightarrow (0, 0)} \frac{\text{error}}{\sqrt{x^2 + y^2}} = 0$

\parallel
 $\lim_{r \rightarrow 0} \frac{r^{1.5}}{r^1} = 0.$

Eg 3: $f_3(x, y) = \begin{cases} \frac{x^3}{x^2 + y^2} & (x, y) \neq (0, 0) \\ 0 & (x, y) = (0, 0) \end{cases}$

Try to find $f_x(0, 0) (= 1)$
 and $f_y(0, 0) (= 0)$.

Figure 2: Problem 2, continued

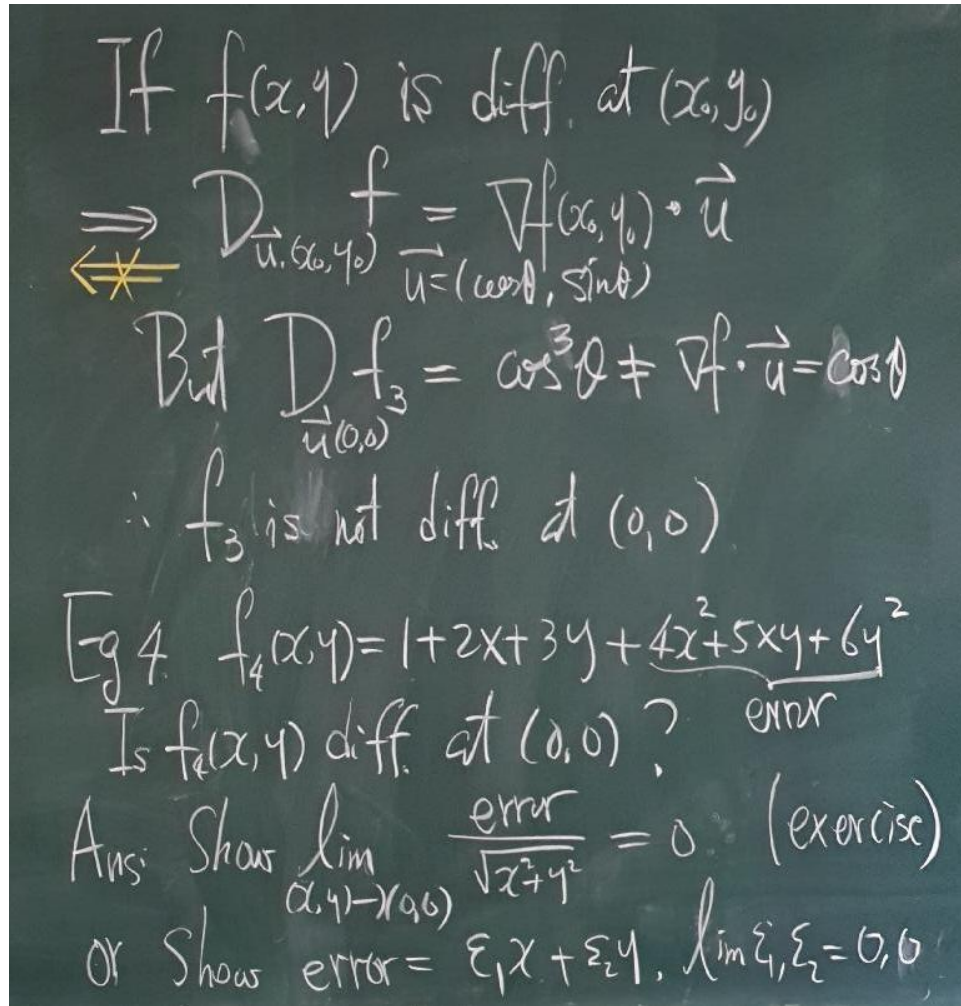


Figure 3: Problem 2, continued

2. (Extra credit) True or False?

If $f_x(0, 0)$, $f_y(0, 0)$ and $D_{(\cos \theta, \sin \theta), (0, 0)} f$ all exist and

$$D_{(\cos \theta, \sin \theta), (0, 0)} f = f_x(0, 0) \cos \theta + f_y(0, 0) \sin \theta,$$

then f is differentiable at $(0, 0)$.