Norwegian University of Science and Technology
Department of Mathematical Sciences

Mathematical Methods B
Spring 2022

Exercise set 9

Information: (b) “Linear approximation” refers to the “tangent plane”, (b) the concept of a directional derivative will be topic of the lecture on March 15.

10.3.6 Find $\frac{\partial f}{\partial x}$ and $\frac{\partial f}{\partial y}$ for

$$f(x, y) = \tan(x - 2y)\,.$$

10.3.41 Find $\frac{\partial^2 f}{\partial y \partial x}$ for

$$f(x, y) = x \cdot \mathrm{e}^y\,.$$

10.4.28 Find the linear approximation of

$$f(x, y) = \tan(2 \cdot x - 3 \cdot y^2)$$

at $(0, 0)$ and use it to approximate $f(0.03, 0.05)$. Compare the approximation with the exact value $f(0.03, 0.05)$.

10.5.3 Let $f(x, y) = \sqrt{x^2 + y^2}$ with $x(t) = t$ and $y(t) = \sin t$. Find the derivative $w'(\frac{\pi}{3})$ for

$$w(t) = f(x(t), y(t))\,.$$

10.5.19 Find the gradient of

$$f(x, y) = \sqrt{x^3 - 3 \cdot x \cdot y}\,.$$

10.5.28 Compute the directional derivative of

$$f(x, y) = x^3 \cdot y^2$$

at $(x_0, y_0) = (2, 3)$ in the direction $\begin{pmatrix} -2 \\ 1 \end{pmatrix}$.

10.5.35 In what direction does

$$f(x, y) = 3 \cdot x \cdot y - x^2$$

increase most rapidly at $(-1,1)^\top$?

Deadline: Sunday, March 20, 2022 (digitally as a single pdf-file via Blackboard)