# Analysis III - 203(d)

Winter Semester 2024

## Session 1: September 12, 2024

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**Exercise 1** *Compute the norms (that is, lengths), the* 3 *scalar products and* 6 *vector products of the following vectors. Find the volume of the parallelepiped spanned by these vectors.*

$$\vec{a} = \begin{pmatrix} 1 \\ 2 \\ -1 \end{pmatrix}, \vec{b} = \begin{pmatrix} 2 \\ -1 \\ 0 \end{pmatrix}, \vec{c} = \begin{pmatrix} 1 \\ 1 \\ 3 \end{pmatrix}$$

**Exercise 2** *Consider the function*

$$f(x, y) = \sin\left(2\pi x^2 + 2\pi y^2\right)$$

*Find the first derivatives in* $x$ *and* $y$*. Sketch the level sets of* $f$ *for the values* 0 *and* 1*.*

**Exercise 3** *Sketch the following vector field:*

$$f(x, y) = \begin{pmatrix} \sin(x) \\ sin(y) \end{pmatrix}$$

**Exercise 4** *Compute the following integrals:*

$$\int_0^1 \int_0^1 x^2 e^y \, dxdy, \quad \int_0^1 x^2 \cos(x) \, dx.$$