1. You have 50 minutes and an additional 15 minutes to upload your exam on gradescope. It is your responsibility to get the exam uploaded in time.

2. No calculators, internet sources or printed material besides the course book and lecture notes, and no interactions with anyone else. Students who get caught cheating may be suspended or expelled from the university.

3. If you have questions, you can email me at wenzl.hans @ gmail.com. You may occasionally check your email in case I make a general announcement.

4. Upload your statement and solutions in the provided spaces on gradescope.

5. Justify your answers!

0. Write on your exam I am following the regulations for this exam and I am aware of the risks of breaking them and sign it. You can start with Problem 1 on the same page.

1. Let $c$ be the line from $(1, 0)$ to $(2, 2)$, and let $f(x, y) = xy$. Calculate the path integral $\int_c f(x, y) \, ds$.

2. Calculate the line integral $\int_C \mathbf{F} \cdot d\mathbf{s}$, where $C$ is the part of the parabola $y = x^2$ going from the point $(-1, 1)$ to the point $(1, 1)$, and where $\mathbf{F}(x, y) = (-y, x)$.

   (In case you cannot parametrize $c$, calculate $\int_c \mathbf{F} \cdot d\mathbf{s}$ for $c(t) = (t^2, t^3)$, $0 \leq t \leq 2$ for partial credit).

3. Let the surface $S$ be given by the parametrization $\Phi(x, \theta) = (x, \sqrt{1 + x^2} \cos \theta, \sqrt{1 + x^2} \sin \theta)$, with $0 \leq \theta < 2\pi$ and $x \in \mathbb{R}$.

   Find the equation of the tangent plane at the point $(1, \sqrt{2}, 0)$.

4. Let $S$ be the surface given by $3x + 2y + z = 6$ with $x \geq 0$, $y \geq 0$ and $z \geq 0$.

   Calculate $\int \int_S x^2 \, dS$. 