MIDTERM 2 MATH 20E Fall 2020

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 can not 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 $\int\int_S x^2\, dS$.