## MIDTERM 1    MATH 20E    Fall 2020

1. You have 50 minutes and an additional 15 minutes to upload your exam on gradescope.
2. **No** calculators, internet sources or printed material besides the course book and lecture notes, and **no** interactions with anyone else.
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.

0. Write on your exam that you are following the regulations for this exam and sign it.

1. Let $f(x, y) = e^{3x+4y}$.
(a) Find the equation of the plane tangent to the graph of $z = f(x, y)$ at $(0, 0, 1)$.
(b) Determine the second order Taylor polynomial of that function at $(0, 0)$.

2. Let $f(x, y) = (y\sqrt{x}, x^2 e^y)$.
(a) Calculate the derivative $Df$ at $(1, 0)$.
(b) Let $c : \mathbb{R} \to \mathbb{R}^2$ be a curve such that $c(0) = (1, 0)$ and such that $c'(0) = (1, 1)$ . Use the chain rule to calculate $D(f \circ c)(0)$.

3. Change the order of integration and evaluate the integral $\int_0^4 \int_{y/2}^2 e^{x^2} \, dx dy$. Clearly sketch the domain of integration and indicate how you found the new limits of integration.

4. Calculate the integral $\int \int \int_W \sqrt{x^2 + y^2 + z^2} \, dV$ where $W$ is the region given by $1 \leq x^2+y^2+z^2 \leq 4$ and $z \geq 0$.