Practice Questions for Hour Test 2
Math 200: Section 11, Autumn 2015
Instructor: William Feldman

On the exam you will be asked to always show the work leading to your answer for full credit. This practice exam is not designed with the time limit in mind (although the test will be this time!). I have not written questions here about all the possible topics which may be on the exam, refer to the topics list and your previous homework assignments for more possible material.

Problem 1. Consider the following iterated integral $\int_{-1}^{1}\int_{|x|-1}^{1-|x|} f(x,y)\,dxdy$. Carefully and clearly draw the region of integration for the associated double integral, then change the order of integration.

Problem 2. Draw the vector field $V(x) = x/\|x\|$ for $x \in \mathbb{R}^2$. Draw the flow lines of V and mark with arrows the direction that the solutions of $c'(t) = V(c(t))$ travel along the flow lines.

Problem 3. Write an iterated integral to compute the volume of the region of $\mathbb{R}^3$ with $x \geq 0$, $y \geq 0$, $0 \leq z \leq x^2 + y^2$ and $x + y \leq 1$. Compute the iterated integral that you derived. It may be helpful to carefully draw the region of integration.

Problem 4. Carefully and clearly draw the region D satisfying $-1 \leq z \leq 1$ and $0 \leq r \leq 1 - |z|$. Using Cavalieri's principle or cylindrical coordinates compute the volume of the region.

Problem 5. Using an appropriate change of variables compute the area of an ellipse in $\mathbb{R}^2$ with axes of length a, b, i.e. $E = \{(x,y) \in \mathbb{R}^2 : \frac{x^2}{a^2} + \frac{y^2}{b^2} = 1\}$.

Problem 6. Compute the curl and the divergence of the vector fields $V(x,y) = (-2y, x)$ and $F(x,y) = (x+y, x-y)$.

Problem 7. Compute the total work done on a particle moving along $c(t) = (\cos t, \sin t)$ between $t = 0$ and $t = 2\pi$ by the force field $F(x,y) = (1,1)$.