Exercise Sheet 5
Multivariate Calculus

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Friday, April 23rd, 2021

The exercises must be handed in on Blackboard on Monday, May 10th at the latest.

Problem 1 (10 points)

For each of the following integrals, change the order of integration and compute the integral. It might be helpful for you to draw the domain of integration:

1. *(5 points)*
$$\int_0^{\sqrt{2}} \int_{-\sqrt{4-2y^2}}^{\sqrt{4-2y^2}} y dx dy$$

2. *(5 points)*
$$\int_0^4 \int_{\frac{y}{2}}^{\sqrt{y}} x^2 y^2 dx dy$$

Problem 2 (6 points)

Let D be the region of the first quadrant of $\mathbb{R}^2$ limited by the lines $y = 0$ and $3x - 4y = 0$ and the circumference $x^2 + y^2 = 25$. Express the integral

$$\iint_D x dx dy$$

as an iterated integral and compute it.

Problem 3 (4 points)

Compute the area of the region $D = \{(x, y) \in \mathbb{R}^2 \mid 3y \geq x^2,\ x^2 + y^2 \leq 4\}$.