

Math 3001 Analysis 1
Homework Set 8

Spring 2017

Course Instructor: Dr. Markus Pflaum

Contact Info: Office: Math 255, Telephone: 2-7717, e-mail: markus.pflaum@colorado.edu.

Problem 1: Recall that $\cosh x := \frac{e^x + e^{-x}}{2}$ and $\sinh x := \frac{e^x - e^{-x}}{2}$. Prove that the function $\tanh : \mathbb{R} \rightarrow \mathbb{R}$, $x \mapsto \frac{\sinh x}{\cosh x}$ is strictly increasing and everywhere differentiable. Compute the derivative \tanh' and the image I of \tanh . Then determine the derivative of the inverse function $\text{Artanh} : I \rightarrow \mathbb{R}$. (5P)

Problem 2: Compute the following integrals:

a)

$$\int \frac{1}{\sin(2t)} dt,$$

b)

$$\int \frac{1}{t^4 - 16} dt.$$

(6P)

Problem 3: Determine the integral

$$\int \frac{1}{ax^2 + bx + c} dx$$

depending on $a, b, c \in \mathbb{R}$, where $a \neq 0$ is assumed. (4P)

Problem 4: Determine the following integrals:

a)

$$\int_0^{2\pi} x \cos x dx,$$

b)

$$\int_0^{\pi} x \sin x dx.$$

(6P)

Problem 5: Determine the integral

$$\int e^{-x} \cos(5x) dx.$$

(4P)