Technische Hochschule Rosenheim
Applied Artificial Intelligence - Bachelor
Analysis 1
Priv.-Doz. Dr. S.-J. Kimmerle

WiSe 2021/22

Thursday, 23.12.2021

Homework 12: integral calculus

To submit: on **Thursday, 13.01.2022**, 9:30 a.m., online by the learning campus

Exercise 1 (10 pts.)

Compute the following integrals using partial fraction expansion and equating coefficients:

a) [5 pts.]

$$\int_3^4 \frac{x+10}{x^2+5x-14}\,dx$$

b) [5 pts.]

$$\int_0^1 \frac{x-1}{(x-2)^3}\,dx$$

Exercise 2 (9 pts.)

a) Compute

$$\int_0^\infty \frac{1}{1+x^2}\,dx.$$

b) Compute for $\lambda > 0$

$$\int_0^R x\exp(-\lambda x)\,dx.$$

What happens in the limit $R \to \infty$?

c) Show that

$$\int_{-R}^1 \frac{1}{\sqrt{1-x}}\,dx$$

diverges as $R \to \infty$.

Exercise 3 (6 pts.)

Let $n \in \mathbb{N}_0$. Show that:

$$\int_0^\infty x^n \exp(-x)\,dx = n!$$