Partial Exam 3 for Analysis 1 (AM1040)
Online version
Friday January 22, 2021, 15h15–16h05

- This is an open book exam. You are allowed to use the book (Lay) and the reader. You are also allowed the use of a simple, non-graphical, calculator. You are not allowed to use any other external sources of information, including, but not limited to, your own notes, the resources on Brightspace or on the rest of the Internet, or other people.

- As the first two sentences of the exam please write and adhere to the following statement and **sign** it:
  "I declare that I have made this examination on my own, with no unauthorized assistance from people or other sources and in accordance with the TU Delft policies on plagiarism, cheating and fraud. I created the submitted answers all by myself during the time slot that was allocated for that specific exam part."

- Please follow the **instructions given on Brightspace** when handing in your work. Use a new page for each question. Clearly write your name, student number, and the number of the question at the top of each page you hand in. Create a separate pdf (no other file type) for each question and use the following naming convention for your files: lastname_firstname_studentnumber_questionnumber.pdf.

- Give your answers in English if possible (because that language is common to all the markers). If needed, Dutch is acceptable as well.

- Unless explicitly stated otherwise, you are required to provide clear proofs for any statements you make. In particular, if you use a result from the book or reader, show that all the required assumptions hold, and clearly state which conclusion(s) you draw.

- You cannot discuss the questions with anyone before Friday January 29, 2021.

- If you participate in this exam, you may be selected afterwards for an online remote face-to-face check. If you are selected, participation in this check will be required to validate your result on the exam.

- This exam has 4 questions. The grade is $(10 \cdot \#\text{marks})/32$, rounded to tenths.

1 Compute $\int_0^1 2xe^{3x}\,dx$. [*6 pts*]

2 Compute $\int \frac{x^2+3x+10}{x^3+6x^2+10x}\,dx$. [*10 pts*]

3 Prove if $\int_0^1 \frac{1}{x+x^4}\,dx$ converges or diverges. [*8 pts*]

4 Let N be a strictly positive integer, let $S := \{s_1, \ldots, s_N\} \subset [0,1]$ be a set of N elements, and let the function $f : [0,1] \to [0,\infty)$ be such that $f = 0$ on $\mathbb{R} \setminus S$ (i.e. f is zero everywhere on $[0,1]$ except possibly at the points from S, where it can be strictly positive). Prove that f is Riemann integrable on $[0,1]$ and

$$\int_0^1 f(x)\,dx = 0.$$

[*8 pts*]