



Mathematics for computer science 1

Winterterm 2019/20

Hand in your solution sheet in the mailboxes (next to Zeichensaal U.39, building E2 5) by Jan. 29 **before the lecture**.

All exercise sheets and course information can be found at: www.math.uni-sb.de/ag/schreyer/

Sheet 12

22. January 2019

Exercise 1 (Improper integral). Compute the following improper integrals

(a) $\int_0^{\infty} x e^{-x^2} dx,$

(b) $\int_0^1 \frac{1}{\sqrt{1-x^2}} dx.$

Exercise 2 (Integrals). Compute the following integrals

(a) $\int_0^{\sqrt{\pi}} (5x \sin(x^2)) dx,$

(b) $\int_0^{2\pi} (x^2 \sin(2x) + 3x \sin(2x)) dx,$

(c) $\int_0^{\frac{\pi}{2}} \sin(x) (\cos(x))^2 dx.$

Exercise 3 (Integral of a rational function). Let $f : D \rightarrow \mathbb{R}$ be defined by

$$f(x) = \frac{1}{x^2 - 3x + 2},$$

where $D \subset \mathbb{R}$ is the maximal possible domain of definition. Determine the integral of f (Hint: use partial fraction decomposition).

Exercise 4 (Taylor polynomial). Determine (without a computer) the Taylor polynomial of order 4 of $f : \mathbb{R} \rightarrow \mathbb{R}, x \mapsto f(x) = \ln(\sin(x))$ in $x_0 = \frac{\pi}{2}$.