Fachbereich Mathematik
Dr. L. Leuştean
K. Altmann, E. Briseid, S. Herrmann

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DARMSTADT

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7. Home work Analysis II for MCS
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(H7.1)

Compute the following integrals.

(i)
$$\int_0^{2\pi} |\sin x| \, \mathrm{d}x.$$

(ii)
$$\int_2^{e^2} \frac{1}{x \log x} \, \mathrm{d}x.$$

(iii)
$$\int_0^1 \arctan x \, \mathrm{d}x.$$

(H7.2)

Compute the following integrals.

(i)
$$\int_1^e \frac{\log x}{x} \, \mathrm{d}x.$$

(ii)
$$\int_0^\pi x^2 \cos x \, \mathrm{d}x.$$

(iii)
$$\int_0^1 x \arctan x \, \mathrm{d}x.$$

(H7.3)

Prove the **Cauchy-Schwarz-Bunyakovski Inequality** for continuous $f, g : [a, b] \to \mathbb{R}$, i.e.

$$(\int_a^b fg)^2 \leq (\int_a^b f^2)(\int_a^b g^2),$$

for $a < b \in \mathbb{R}$.