Homework 5
Deadline: 29.3.2018 at 14:00
Justify every claim formally! Whenever you use a theorem, specify which one you use and explicitly verify that its assumptions are satisfied!

1. Decide whether the following integral exists as $(N)$ and/or $(R)$ integral and calculate its value.

$$
\int_{-\pi}^{\pi} \frac{1}{(1+\cos x)^{2}} \sin \left(\frac{1}{1+\cos x}\right) \sin x \mathrm{~d} x
$$

2. Let $f: \mathbb{R} \rightarrow \mathbb{R}$ be a continuous function such that $f\left(\frac{\pi}{2}-x\right)=f\left(\frac{\pi}{2}+x\right)$ holds for every $x \in \mathbb{R}$. Show that for every $a>0$

$$
\int_{\frac{\pi}{2}-a}^{\frac{\pi}{2}+a} f(x) \cos x \mathrm{~d} x=0
$$

3. Calculate the following integral:

$$
(R) \int_{0}^{\ln 5} \frac{\mathrm{e}^{x} \sqrt{\mathrm{e}^{x}-1}}{\mathrm{e}^{x}+3} \mathrm{~d} x
$$

