

Lösung: Aufgabe 4

a) 1) $\int_0^{2e} \delta(x-e) \ln(x) dx = \ln(e) = 1$, da $e \in [0, 2e]$

1/2

2) $\int_0^{\infty} \frac{e^x}{x^2} \delta(x+1) dx = 0$, da $-1 \notin [0, \infty)$

1/2

3) $\int_{-\infty}^{\infty} x \delta(x) \cdot (a_0 + a_1 x + a_2 x^2 + a_3 x^3) dx = 0 \cdot (a_0 + a_1 \cdot 0 + a_2 \cdot 0 + a_3 \cdot 0) = 0$
da $0 \in (-\infty, \infty)$

1

4) $\int_{-\infty}^{2\pi} \cos x \delta(x^2 - \pi^2) dx = \frac{1}{2\pi} (\cos(\pi) + \cos(-\pi)) = -\frac{1}{\pi}$

1

NR: $x_c^2 = \pi^2 \Rightarrow x_{c1} = \pi, x_{c2} = -\pi$

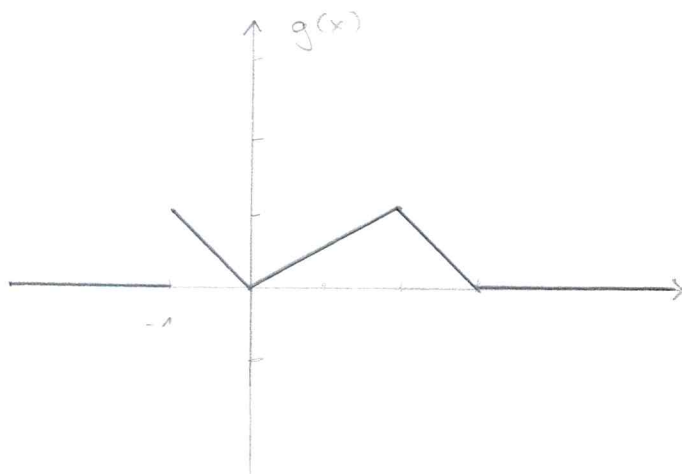
$g(x) = x^2 - \pi^2 \leadsto g'(x) = 2x$

$|g'(x_{c1})| = |g'(x_{c2})| = 2\pi$

b) $\rho(x, y) = 1q \delta(x-1) \delta(y-1) - q \delta(x+1) \delta(y+1) + 2q \delta(y) \delta(x+2) - 2q \delta(y) \delta(x-2)$
 $+ 2q [\Theta(y+2) - \Theta(y-2)] \delta(x)$

2

c)



2