

# Analysis Übung 3

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## Übungen

A6e)

$$\lim_{x \rightarrow \frac{\pi}{2}} \left( \frac{\pi}{2} - x \right) \tan x$$

$$\tan x = \frac{\sin x}{\cos x}$$

$$\lim_{x \rightarrow 0} \frac{\sin(ax)}{x} = a$$

$$\lim_{x \rightarrow \frac{\pi}{2}} \frac{\frac{\pi}{2} - x}{\cos x} \sin x$$

$$y = \frac{\pi}{2} - x \rightarrow \lim_{x \rightarrow \frac{\pi}{2}} y = \lim_{x \rightarrow \frac{\pi}{2}} \frac{\pi}{2} - x = 0^+$$

$$\Rightarrow x = \frac{\pi}{2} - y$$

$$\begin{aligned} \Rightarrow \lim_{y \rightarrow 0^+} \frac{\frac{\pi}{2} - \frac{\pi}{2} + y}{\cos(\frac{\pi}{2} - y)} \sin(\frac{\pi}{2} - y) &= \lim_{y \rightarrow 0^+} \frac{y}{\sin} \sin(\frac{\pi}{2} - y) \\ &= 1 \cdot 1 = 1 \end{aligned}$$

A6f)

$$l = \lim_{x \rightarrow +\infty} \frac{x}{2} \left( \frac{1}{\cos \frac{\pi}{x}} \right)^2 \sin \frac{2\pi}{x}$$

$$\text{sub: } y := \frac{1}{x}$$

$$\lim_{x \rightarrow +\infty} y = 0^+$$

$$\Rightarrow l = \lim_{y \rightarrow 0^+} \frac{1}{2y} \left( \frac{1}{\cos(\pi y)} \right)^2 \sin(2\pi y)$$

$$\lim_{y \rightarrow 0^+} \frac{1}{\cos(\pi y)} = 1$$

$$\Rightarrow l = \frac{1}{2} \frac{\sin(2\pi y)}{y} = \frac{1}{2} 2\pi = \pi$$