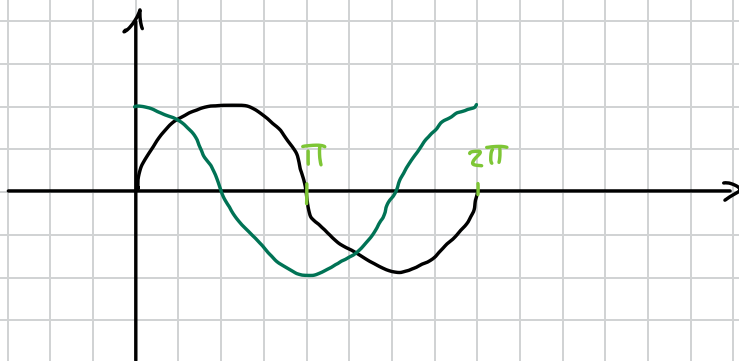


## Aufgabe 2

$$h(t) = \begin{cases} \frac{\pi-t}{2} & 0 < t < 2\pi \\ 0 & t = 0, 2\pi \end{cases}$$

$$\begin{aligned} a_0 &= \frac{1}{\pi} \int_0^{2\pi} \frac{\pi-t}{2} \cos(0) dt = \frac{1}{2\pi} \left[ \pi t - \frac{1}{2} t^2 \right]_0^{2\pi} \\ &= \frac{1}{2\pi} \left( 2\pi^2 - \frac{1}{2} 4\pi^2 \right) = 0 \end{aligned}$$

$$\begin{aligned} a_k &= \frac{1}{2\pi} \int_0^{2\pi} (\pi-t) \cos(kt) dt \\ &= \frac{1}{2\pi} \int_0^{2\pi} \pi \cos(kt) - \underbrace{t}_{u} \underbrace{\cos(kt)}_{v'} dt \quad \begin{matrix} u' = 1 \\ v = \frac{1}{k} \sin(kt) \end{matrix} \\ &= \frac{1}{2\pi} \left[ \pi \sin(kt) \frac{1}{k} - t \frac{1}{k} \sin(kt) \right]_0^{2\pi} + \int_0^{2\pi} \frac{1}{k} \sin(kt) dt \\ &= \frac{1}{2\pi} \left[ \sin(kt) \frac{\pi-t}{k} - \frac{1}{k^2} \cos(kt) \right]_0^{2\pi} \\ &= \frac{1}{2\pi} \left( 0 - \frac{1}{k^2} (1-1) \right) \\ &= 0 \end{aligned}$$



$$\begin{aligned}
 b_k &= \frac{1}{2\pi} \int_0^{2\pi} (\pi - t) \sin(kt) dt \quad \begin{array}{l} u' = 1 \\ v' = -\cos(kt) \frac{1}{k} \end{array} \\
 &= \frac{1}{2\pi} \left[ -\frac{\pi}{k} \cos(kt) + \frac{1}{k} \cos(kt) \right]_0^{2\pi} + \int_0^{2\pi} \cos(kt) \frac{1}{k} \\
 &= \frac{1}{2\pi} \left( \underbrace{-\frac{\pi}{k} (1-1)}_{=0} + \frac{2\pi}{k} \cos(k \cdot 2\pi) + \underbrace{\frac{0}{k} \cos(0)}_{=0} \right) + \underbrace{\left[ \frac{1}{k^2} \sin(kt) \right]_0^{2\pi}}_{=0} \\
 &= \frac{1}{2\pi} \left( \frac{2\pi}{k} \cdot 1 \right) \\
 &= \frac{1}{k}
 \end{aligned}$$

$$\overline{f}_n(x) = \frac{1}{1} \sin(x) + \frac{1}{2} \sin(2x) + \frac{1}{3} \sin(3x) + \frac{1}{4} \sin(4x) + \dots$$