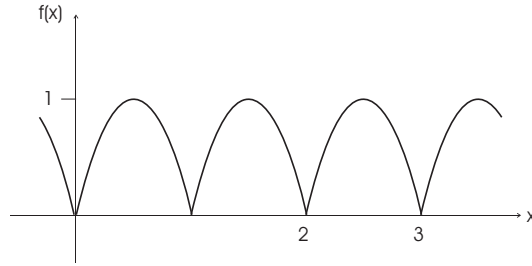


## 3.11.3 Example: Absolute of sin function

$f(x) = |\sin x|$  periodic in  $\pi$



even function  $\Rightarrow b_k \equiv 0$

$$\frac{a_0}{2} = \frac{1}{\pi} \int_0^{\pi} \sin x \, dx = \frac{1}{\pi} [-\cos x]_0^{\pi} = \frac{2}{\pi}$$

$$\begin{aligned} a_k &= \frac{2}{\pi} \int_0^{\pi} \sin x \cos 2kx \, dx = \frac{2}{\pi} \left[ -\frac{\cos(1+2k)x}{2(1+2k)} - \frac{\cos(1-2k)x}{2(1-2k)} \right]_0^{\pi} \\ &= \frac{2}{\pi} \left[ \frac{1}{1+2k} + \frac{1}{1-2k} \right] = -\frac{4}{\pi} \frac{1}{4k^2-1} \end{aligned}$$

Thus:  $f(x) = \frac{2}{\pi} - \frac{4}{\pi} \sum_{k=1}^{\infty} \frac{1}{4k^2-1} \cos 2kx \Rightarrow$  Due to  $1/(4k^2-1)$  fast converging series