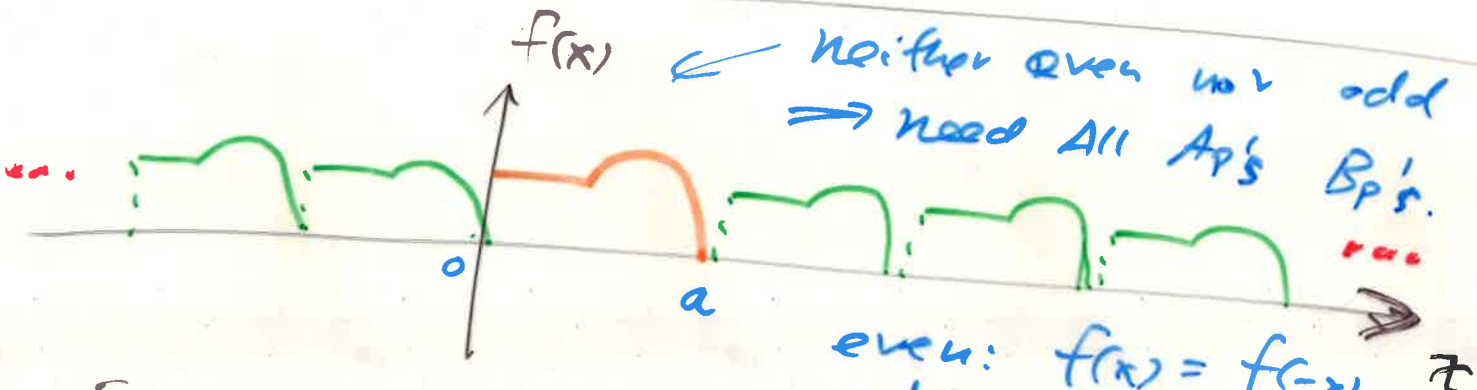
$$\langle a(x) \mid b(x) \rangle = \frac{2}{na} \int_{x=x_0}^{x_0+na} a(x) \cdot b(x) \, dx$$



$\leftarrow$ neither even nor odd

$\Rightarrow$ need All A_p's B_p's.

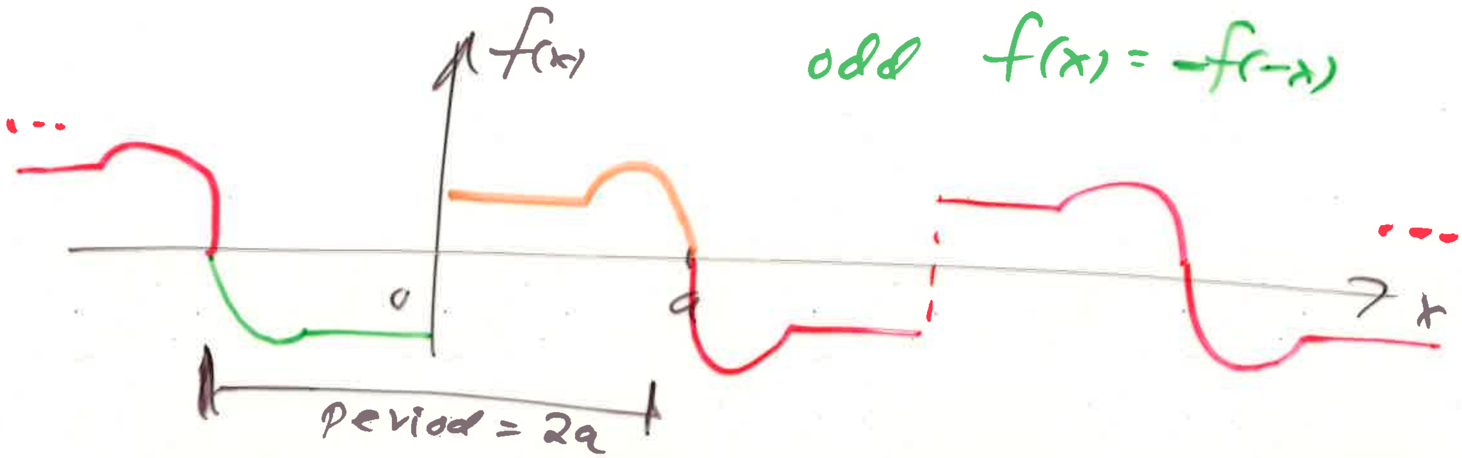
even: $f(x) = f(-x)$

odd: $f(x) = -f(-x)$

Fourier series will converge in the mean (not pointwise) to a function with discontinuities.

$$f(x) = \frac{A_0}{2} + \sum_{p=1}^{\infty} \left[A_p \cos\left(\frac{2\pi p x}{a}\right) + B_p \sin\left(\frac{2\pi p x}{a}\right) \right]$$

discontinuity $\Rightarrow$ $A_p, B_p \propto \frac{1}{p}$ $\leftarrow$ slow convergence.



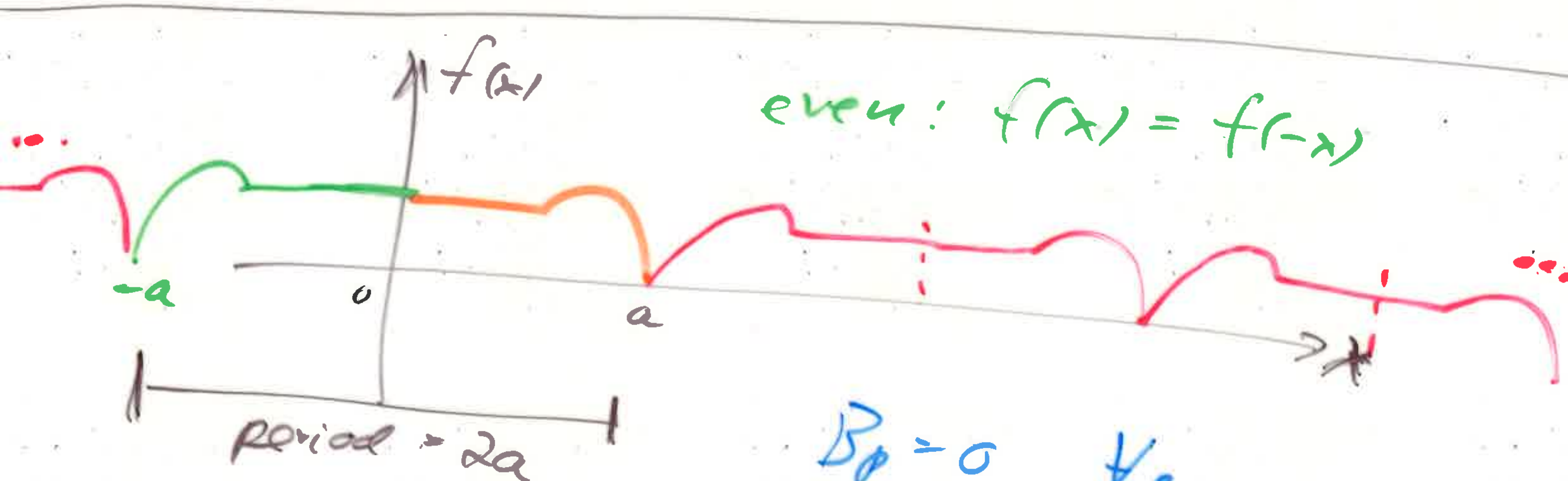
odd $f(x) = -f(-x)$

no cosines $A_p = 0$ $\quad p = 0, 1, 2, 3 \ldots$

$$f(x) = \sum_{p=1}^{\infty} B_p \sin\left(\frac{2\pi p x}{2a}\right)$$

$$B_p = \frac{2}{2a} \int_{\substack{x=\cancel{0} \\ x=-a}}^{\cancel{2a}\ +a} f(x) \sin\left(\frac{2\pi p x}{2a}\right) dx \propto \frac{1}{p}$$

discon-tinuous



even: $f(x) = f(-x)$

$B_p = 0 \quad \forall p$

$$f(x) = \frac{A_0}{2} + \sum_{p=1}^{\infty} A_p \cos\left(\frac{2\pi p x}{2a}\right)$$

$$A_p = \frac{2}{2a} \int_{x=-a}^{+a} f(x) \cos\left(\frac{2\pi p x}{2a}\right) dx \propto \frac{1}{p^2}$$

continuous

even $\Rightarrow B_p = 0$, $A_0 = 0$