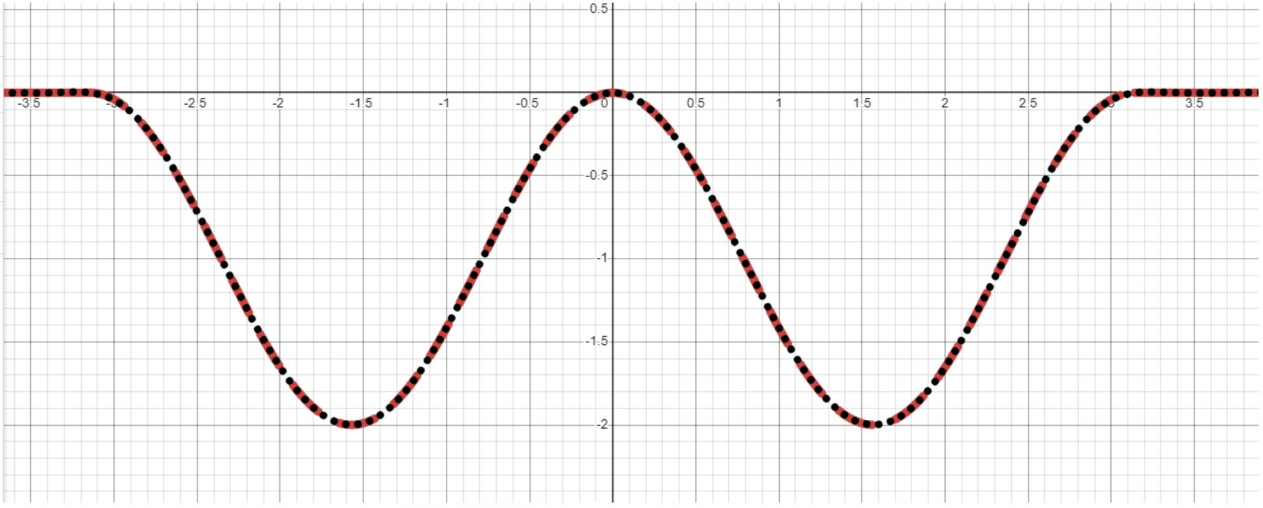
$\cos(2x)-1\ \{-\pi \le x \le \pi\}$

$y=0\ \{x<-\pi, x>\pi\}$

$\frac{4}{\pi}\int_{-10}^{10}\left(\frac{\sin(\pi a)\cos(xa)}{a(a^2-4)}\right)da$



N4

$$f(t)=\begin{cases} t & t\in[-a,a] \\ 0 & t\notin[-a,a] \end{cases}$$

$$a(\lambda)=\frac{1}{\pi}\int_{-a}^{a} y\cos(\lambda y)dy = \underbrace{\frac{1}{\pi}\left(\frac{a\sin\lambda a}{\lambda}+\frac{\cos\lambda a}{\lambda^2}-\frac{-a\sin(-\lambda a)}{\lambda}-\frac{\cos(-\lambda a)}{\lambda^2}\right)}_{0\ (\text{Holds})}$$

$$b(\lambda)=\frac{1}{\pi}\int_{-a}^{a} y\sin(\lambda y)dy=\frac{1}{\pi}\left(-\frac{a\cos\lambda a}{\lambda}+\frac{\sin\lambda a}{\lambda^2}+\frac{-a\cos(-\lambda a)}{\lambda}-\frac{\sin(-\lambda a)}{\lambda^2}\right)\ominus$$

$$\ominus\ \frac{2\sin\lambda a}{\pi\lambda^2}-\frac{2a\cos\lambda a}{\pi\lambda}$$

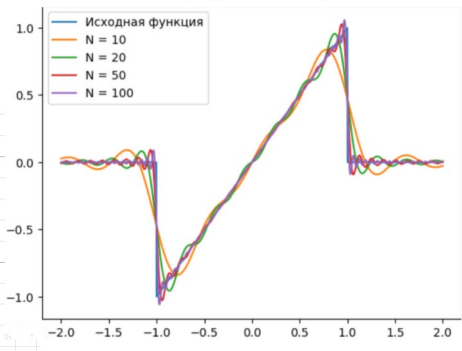
$$\int_0^{+\infty}\left(a(\lambda)\cos(\lambda x)+b(\lambda)\sin(\lambda x)\right)d\lambda$$

$$a(\lambda)=\frac{1}{\pi}\int_{-\infty}^{+\infty} f(y)\cos(\lambda y)\,dy$$

$$b(\lambda)=\frac{1}{\pi}\int_{-\infty}^{+\infty} f(y)\sin(\lambda y)dy$$

$$\int_0^{+\infty}\frac{2\sin(a\lambda)\sin(\lambda x)}{\pi\lambda^2}-\frac{2a\cos(a\lambda)\sin(\lambda x)}{\pi\lambda}\,d\lambda$$

Python 2



$a=1$

$y=x\ \{-a\le x\le a\}$

$y=0\ \{x>a\}$

$y=0\ \{x<-a\}$

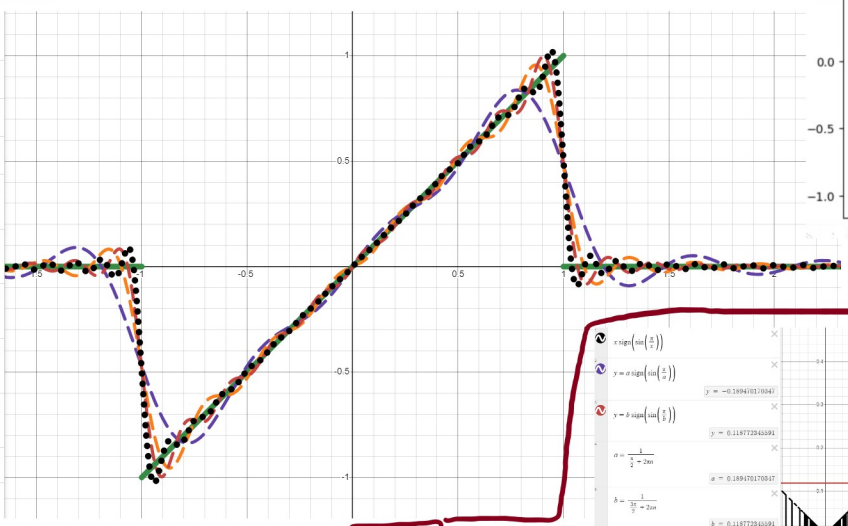
$f(l,x)=\frac{2\sin(al)\sin(xl)}{\pi l^2}-\frac{2a\cos(al)\sin(xl)}{\pi l}$

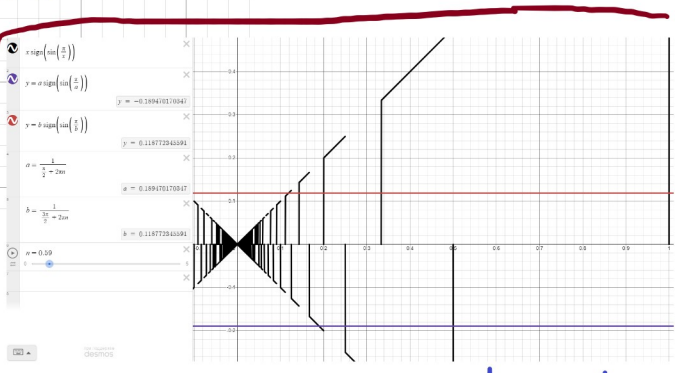
$\int_0^{10} f(l,x)\,dl$

$\int_0^{20} f(l,x)\,dl$

$\int_0^{30} f(l,x)\,dl$

$\int_0^{50} f(l,x)\,dl$





N5

1)

$$f(x)=\begin{cases} 2 \\ x\,\text{sign}\left(\sin\left(\frac{\pi}{x}\right)\right), & 0<x\le 1 \end{cases}$$

$$x_n=\frac{1}{\frac{\pi}{2}+2\pi n}$$

$$x_{n+1}=\frac{1}{3\frac{\pi}{2}+2\pi n}$$

$$\sin\left(\frac{\pi}{x_n}\right)=1$$

$$\sin\left(\frac{\pi}{x_{n+1}}\right)=-1$$

$$|f(x_n)-f(x_{n+1})|=\left|\frac{1}{\frac{\pi}{2}+2\pi n}+\frac{1}{3\frac{\pi}{2}+2\pi n}\right|\ge\frac{1}{\frac{\pi}{2}+2\pi n}$$

$$V_0^1(f)\ge\sum_{n=1}^{\infty}\frac{1}{\frac{\pi}{2}+2\pi n}\sim\frac{1}{2\pi}\sum_{n=1}^{\infty}\frac{1}{n}=\infty\quad[\text{гармонич. ряд}]$$

$$V_0^1(f)=2+\infty=\infty$$

$$\alpha\in\{0\}$$

$$|f(0)-\lim_{x\to 0} f(x)|=|2-0|=2$$

2) Невозможно ф-я не монотонна, бесконечное число скачков на интервале $[0,1]$. скачки $x_n \to x_{n+1}$ беск. осциллирует.