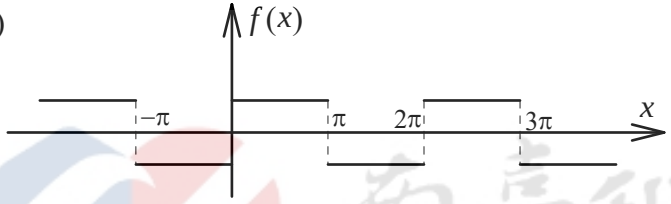
(a)畫出週期函數$f(x)=\begin{cases}1, & 0<x<\pi\\ -1, & \pi<x<2\pi\end{cases}$且$f(x+2\pi)=f(x)$的圖形。(b)請問$f(x)$是奇函數、偶函數，還是非奇、非偶函數？(c)求$f(x)$的傅立葉級數。[103逢甲光電3]

[解](a)



(b)奇函數

(c) $f(x)=\sum_{n=1}^{\infty}b_n\sin nx$

$$b_n=\frac{2}{\pi}\int_0^{\pi}1\cdot\sin nx\,dx=-\frac{2}{\pi}\cdot\left(\frac{\cos nx}{n}\right)\Big|_0^{\pi}=-\frac{2}{\pi}\cdot\frac{\cos n\pi-1}{n}=-\frac{2}{\pi}\cdot\frac{(-1)^n-1}{n}=\frac{4}{(2n-1)\pi}$$

$$f(x)=\frac{4}{\pi}\sum_{n=1}^{\infty}\frac{1}{2n-1}\sin(2n-1)x$$