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1060333

Quiz: $f(x)=\begin{cases} x, & 0\le x\le\pi \\ 0, & -\pi\le x\le 0 \end{cases}$ 周期 2π

$$f(x)=a_0+\int_{-\pi}^{\pi} a_n\cos nx+b_n\sin nx\,dx$$

$$a_0=\frac{1}{2\pi}\int_{-\pi}^{\pi} f(x)\,dx$$

$$=\frac{1}{2\pi}\left(\int_0^{\pi} x\,dx+\int_{-\pi}^{0} 0\,dx\right)$$

$$=\frac{1}{2\pi}\cdot\frac{x^2}{2}\Big|_0^{\pi}+C=\frac{x^2}{4\pi}\Big|_0^{\pi}=\frac{\pi^2}{4\pi}=\frac{\pi}{4}$$

$$a_n=\frac{1}{\pi}\int_{-\pi}^{\pi} f(x)\cdot\cos nx\,dx$$

$$=\frac{1}{\pi}\left(\int_0^{\pi} x\cdot\cos nx\,dx+\int_{-\pi}^{0} 0\cdot\sin nx\,dx\right)$$

$$=\frac{1}{\pi}\left(x\cdot\frac{\sin nx}{n}-\int_0^{\pi}\frac{\sin nx}{n}\,dx\right)$$

$$=\frac{1}{\pi}\left(x\cdot\frac{\sin nx}{n}-\frac{-\cos nx}{n^2}\right)\Big|_0^{\pi}$$

$$=\frac{1}{\pi}\left(x\cdot\frac{\sin nx}{n}+\frac{\cos nx}{n^2}\right)\Big|_0^{\pi}$$

$$=\frac{1}{\pi}\left[\left(\pi\frac{\sin n\pi}{n}+\frac{\cos n\pi}{n^2}\right)-\left(0\frac{\sin 0}{n}+\frac{\cos 0}{n^2}\right)\right]$$

$$=\frac{1}{\pi}\left[\frac{\cos n\pi}{n^2}-\frac{1}{n^2}\right]=\frac{1}{n^2\pi}(\cos n\pi-1)$$

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$b_n =$

$$a_0 = \frac{\pi}{4}$$

$$a_n = \frac{1}{n^2\pi}(\cos n\pi - 1) \quad \text{eg: } a_1 = \frac{-2}{\pi} \quad a_3 = \frac{-2}{9\pi}$$

$$a_5 = \frac{-2}{25\pi}$$

odd : $\frac{1}{n^2\pi} \cdot -2$

even : $\frac{1}{n^2\pi} \cdot 0$

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