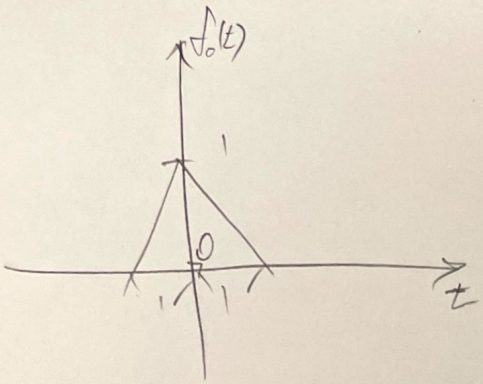
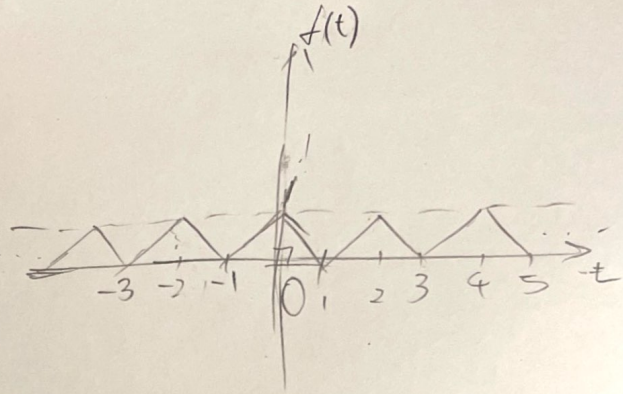
1.





$f(t)=\sum_{n=-\infty}^{+\infty} f_0(t)*\delta(t-2n)=\sum_{n=-\infty}^{+\infty} f(t-2n)$ 是周期函数，周期为2 □

2. 推导卷积的微分公式.

证明：$\frac{d}{dt}[f_1(t)*f_2(t)]=\frac{d}{dt}\int_{-\infty}^{+\infty} f_1(\tau)f_2(t-\tau)d\tau$

$\Rightarrow \int_{-\infty}^{+\infty} f_1(\tau)\left(\frac{d}{dt}f_2(t-\tau)\right)d\tau = f_1(t)*\left[\frac{d}{dt}f_2(t)\right]$

$=\frac{d}{dt}\int_{-\infty}^{+\infty} f_1(t-\tau)f_2(\tau)d\tau$

$\Rightarrow \int_{-\infty}^{+\infty} \frac{d}{dt}f_1(t-\tau)f_2(\tau)d\tau = \left[\frac{d}{dt}f_1(t)\right]*f_2(t)$ □

3. 推导卷积的积分公式

证明：令 $m(t)\triangleq\int_{-\infty}^{t} f_2(\lambda)d\lambda$，则有 $m(t-\tau)=\int_{-\infty}^{t-\tau} f_2(\lambda)d\lambda=\int_{-\infty}^{t} f_2(\lambda-\tau)d\lambda$

则 $\int_{-\infty}^{t}(f_1*f_2)(\lambda)d\lambda=\int_{-\infty}^{t}\left[\int_{-\infty}^{+\infty} f_1(\tau)f_2(\lambda-\tau)d\tau\right]d\lambda$

$=\int_{-\infty}^{+\infty}\left[\int_{-\infty}^{t} f_1(\tau)f_2(\lambda-\tau)d\lambda\right]d\tau$

$=\int_{-\infty}^{+\infty} f_1(\tau)\,m(t-\tau)d\tau$

$=f_1(t)*m(t)=f_1(t)*\int_{-\infty}^{t} f_2(\lambda)d\lambda$ □

△

4. 推导 $f(t)*u(t)=\int_{-\infty}^{t} f(\tau)d\tau$

证明：∵ $u(t)=\int_{-\infty}^{t}\delta(\tau)d\tau$ 作业3

∴ $f(t)*u(t)=f(t)*\int_{-\infty}^{t}\delta(\tau)d\tau=\int_{-\infty}^{t} f(\tau)*\delta(\tau)d\tau=\int_{-\infty}^{t} f(\tau)d\tau$ □