71117408_梅洛瑜

1.4:

a) $f(k)=\varepsilon(k+2)$
b) $f(k)=\varepsilon(k-3)$
c) $f(k)=\varepsilon(-k+2)$
d) $f(k)=(-1)^k\varepsilon(k)$

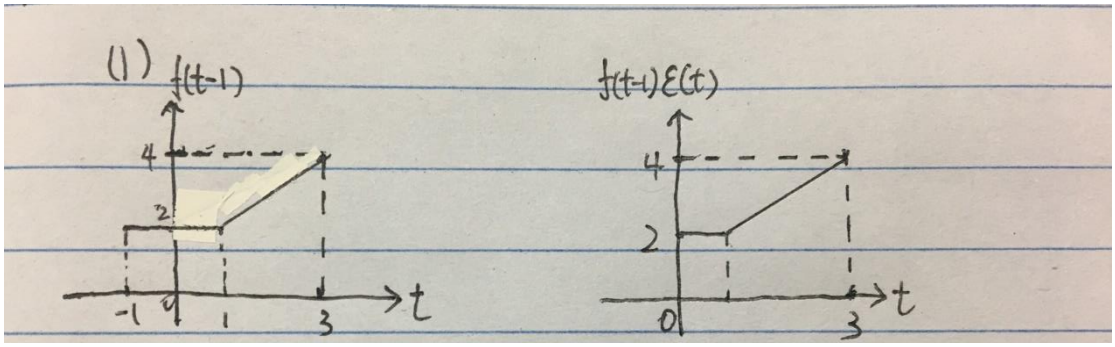
1.5:

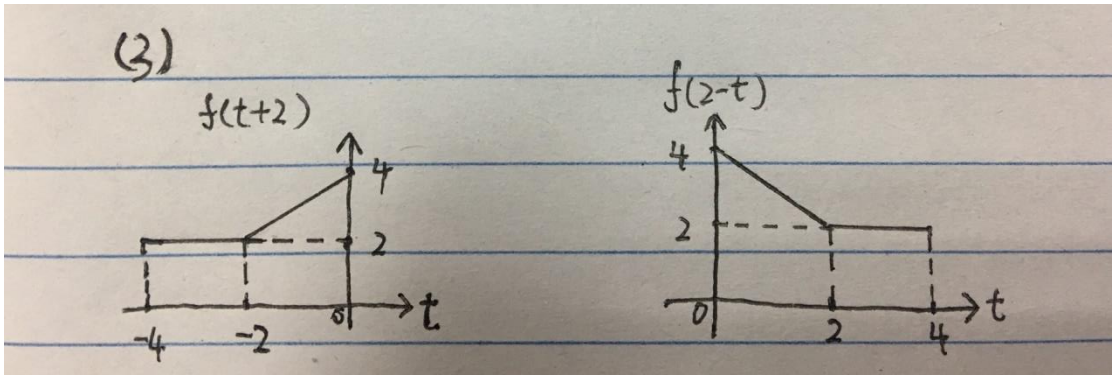
（1）序列为周期序列，T=0.3

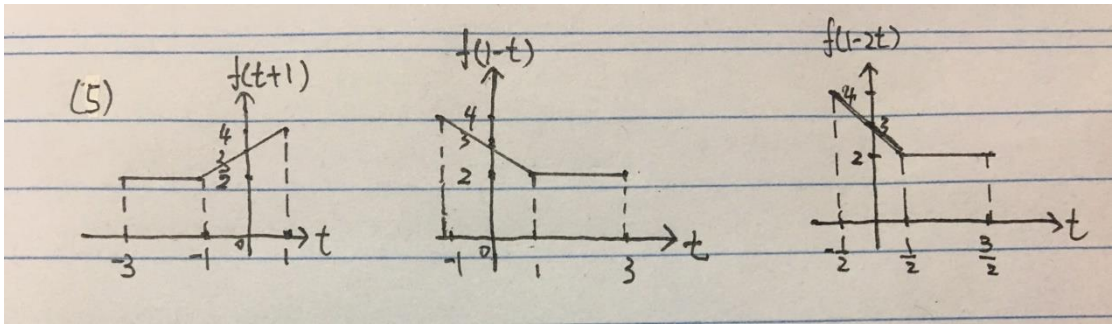
（2）对于 k=1，不存在周期 T 使$f_3(1)=f_3(1+mT)(m=0,\pm1,\pm2\ldots)$

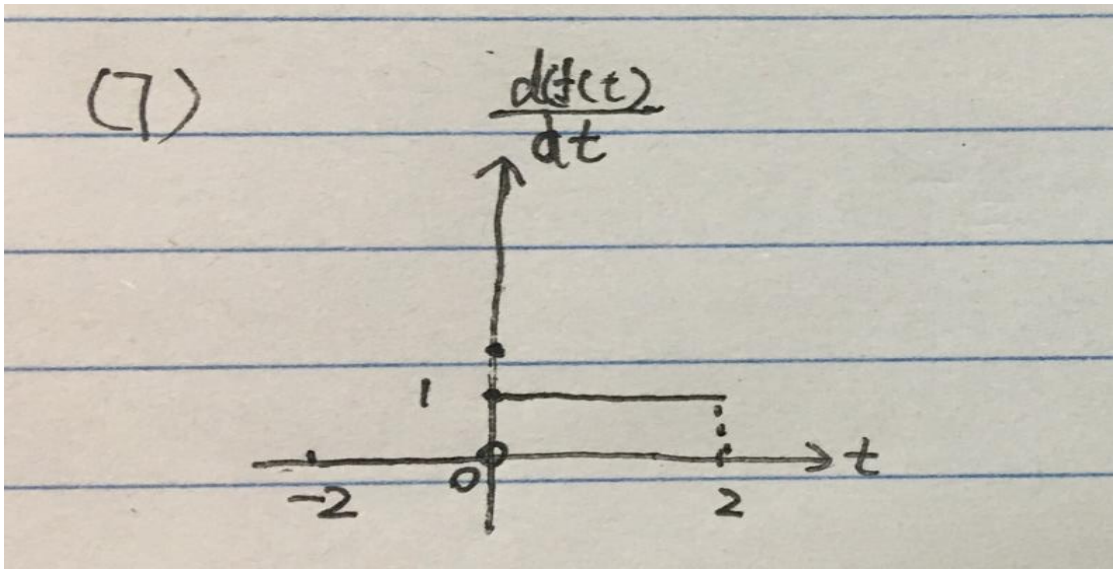
（3）$cos\,t$周期$T_1=2\pi$，$sin(\pi t)$周期$T_2=2$，$\frac{T_1}{T_2}=\pi$不为有理数，故 f5 不具有周期性

1.6:









1.10:

(1)

$$\frac{d^2}{dt^2}[\cos t+\sin 2t]\varepsilon(t) = \frac{d}{dt}\{[-\text{sint}+2\cos(2\text{t})]\varepsilon(\text{t})+[\cos t+\sin 2t]\sigma(t)\}$$

$$=\frac{d}{dt}\{[-\text{sint}+2\cos(2\text{t})]\varepsilon(\text{t})+\sigma(t)\}$$

$$=[-\cos t-4\sin(2t)]\varepsilon(t)+[-\text{sint}+2\cos(2\text{t})]\sigma(t)+\sigma^2(t)$$

$$=[-\cos t-4\sin(2t)]\varepsilon(t)+2\sigma(t)+\sigma^2(t)$$

(2)

$$(1+t)\frac{d}{dt}[e^{-t}\delta(t)]=(1+\text{t})*[-e^{-t}\delta(t)+e^{-t}\delta'(t)]$$

$$=(1+\text{t})*[-\delta(t)+\delta(t)+\delta'(t))]$$

$$=(1+t)*\delta'(t)=\delta'(t)+\delta(t)$$

Tips: $\begin{cases} e^{-at}\delta'(t)=\delta'(t)+a\delta(t) \\ t\delta'(t)=-\delta(t) \end{cases}$

(3)

令$f(t)=\frac{\sin(\pi t)}{t}$, 则$\int_{-\infty}^{\infty}\frac{\sin(\pi t)}{t}\delta(t)\,dt=\int_{-\infty}^{\infty}f(t)\delta(t)\,dt=\text{f}(0)=1$

(4)

$$\int_{-\infty}^{\infty}e^{-2t}\left[\delta(t)+\delta'^{(t)}\right]dt=\int_{-\infty}^{\infty}e^{-2t}\delta'^{(t)}\,dt+\int_{-\infty}^{\infty}e^{-2t}\delta(t)\,dt=2+1=3$$

(5)

$$\int_{-\infty}^{\infty}[t^2+\sin\left(\frac{\pi}{4}t\right)\delta(t+2)]\,dt=[t^2+\sin\left(\frac{\pi}{4}t\right)]\Big|_{t=-2}=3$$

(7)

$$\int_{-\infty}^{\infty}(t^3+2t^2-2t+1)\delta'^{(t-1)}\,dt=[t^3+2t^2-2t+1]'|_{t=1}=5$$