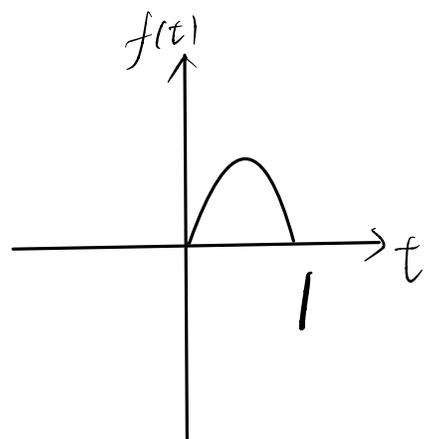


1.2

$$(6) f(t) = \sin(\pi t) [\varepsilon(t) - \varepsilon(t-1)]$$

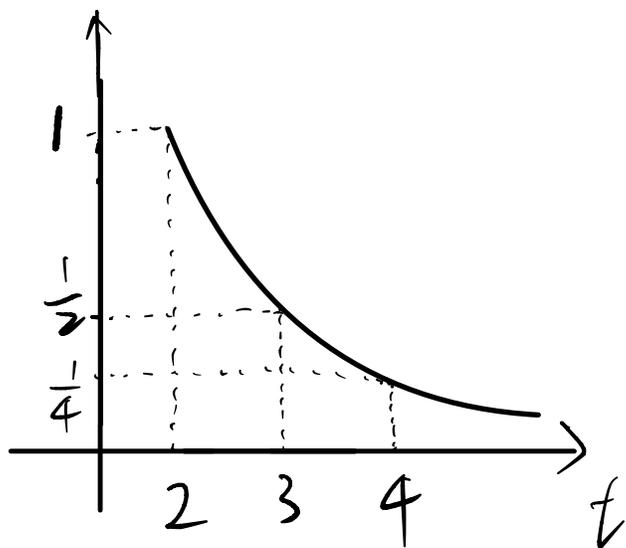
如图:



由阶跃函数的特点:

$$f(t) = \begin{cases} \sin(\pi t) & 0 \leq t \leq 1 \\ 0 & t < 0 \text{ 或 } t > 1 \end{cases}$$

如图:



(10)

由 $\varepsilon(t)$ 函数的特点知:

$$f(k) = \begin{cases} 2^{k-2} & k \geq 2 \\ 0 & k < 2 \end{cases}$$

1.5

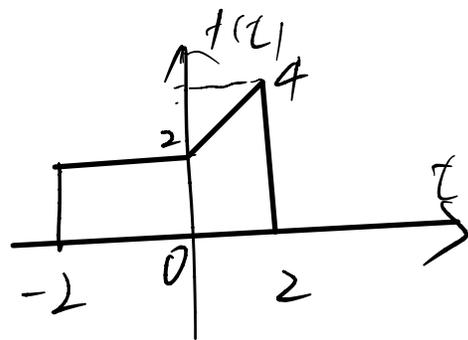
$$(2) f_2(k) = \cos\left(\frac{3\pi}{4}k + \frac{\pi}{4}\right) + \cos\left(\frac{\pi}{3}k + \frac{\pi}{6}\right)$$

因 $\cos\left(\frac{3}{4}\pi k + \frac{\pi}{4}\right)$ 的周期 $T_1 = \frac{2\pi}{\frac{3}{4}\pi} = \frac{8}{3}$. 故 $T_1 = 8$

$\cos\left(\frac{\pi}{3}k + \frac{\pi}{6}\right)$ 的周期 $T_2 = \frac{2\pi}{\frac{\pi}{3}} = 6$.

故 T 为 24.

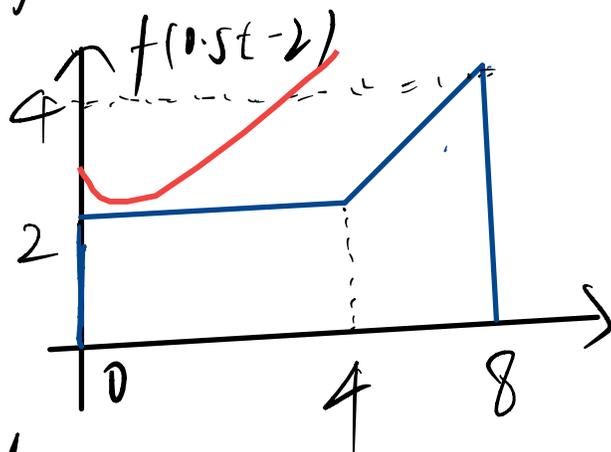
1.6



(6) $f(0.5t-2)$

$f(t)$ $\xrightarrow{\text{向右移2}}$ $f(t-2)$ $\xrightarrow{\text{扩展2倍}}$ $f(0.5t-2)$

故为:

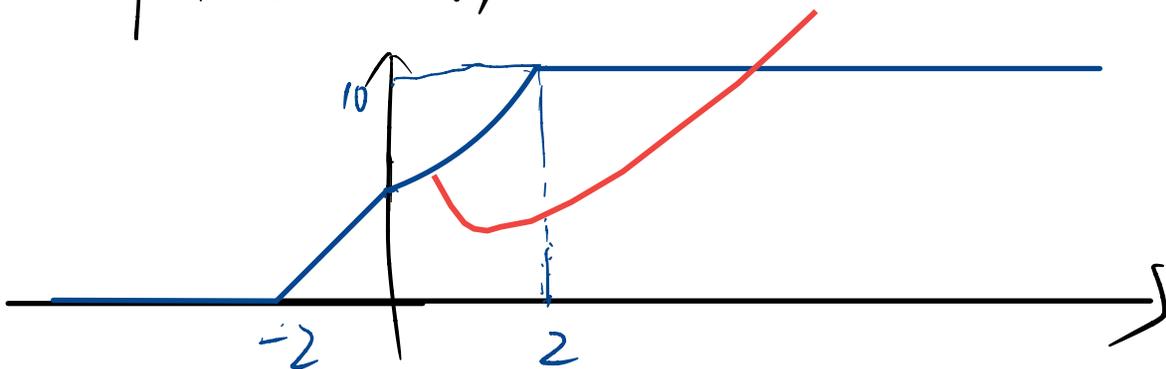


(8) $\int_{-\infty}^t f(x) dx$

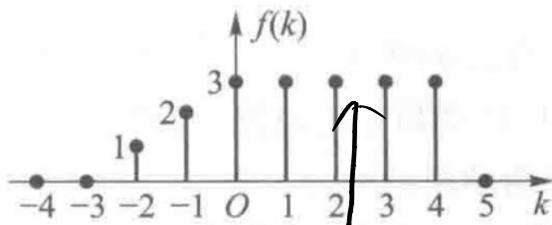
$$f(t) = \begin{cases} 0 & t \leq -2 \text{ 或 } t \geq 2 \\ 2 & -2 \leq t \leq 0 \\ 2+t & 0 \leq t \leq 2 \end{cases}$$

积分后 $\int_{-\infty}^t f(x) dx = \begin{cases} 0 & t \leq -2 \\ 4+2t-2 & -2 \leq t < 0 \\ \frac{1}{2}t^2+2t+4 & 0 \leq t \leq 2 \\ 10 & t \geq 2 \end{cases}$

故积分后的图形为:



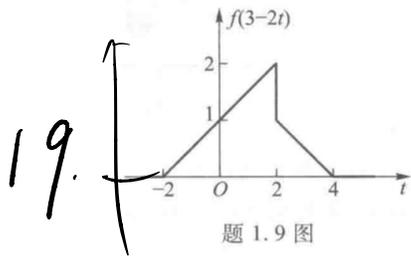
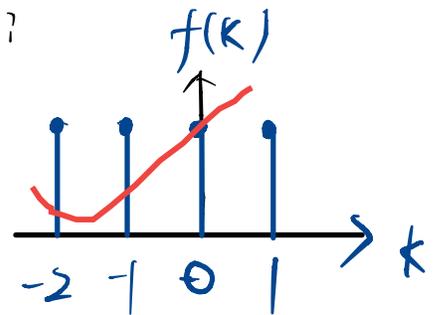
1.7



题 1.7 图

(5) $f(-k+2) \varepsilon(-k+1)$, 先对图像左移 2, 再进行

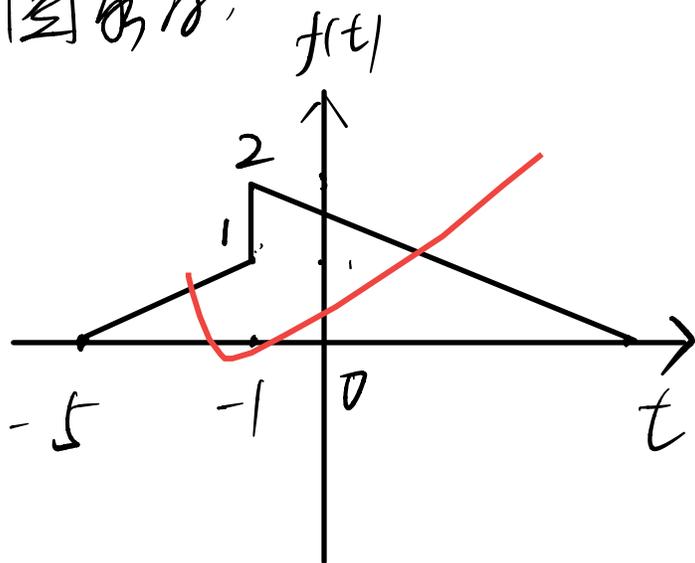
波形反转, 最后保留 $k \leq 1$ 的部分:



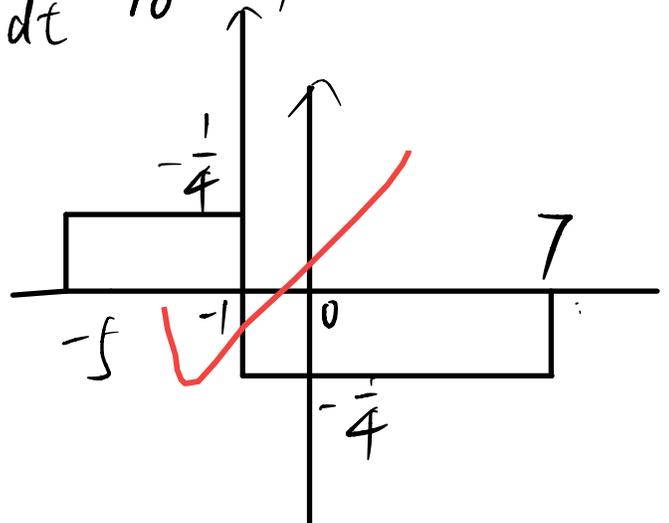
题 1.9 图

$f(3-2t)$ 右移 $\rightarrow f(-2t)$ 扩大 2 倍 $\rightarrow f(-t)$ 反转 $\rightarrow f(t)$

图像为:



则 $\frac{df(t)}{dt}$ 为:



1.10

$$(3) \int_{-\infty}^{+\infty} \frac{\sin(\pi t)}{t} \delta(t) dt$$

$$= \lim_{t \rightarrow 0} \frac{\sin(\pi t)}{t} = \lim_{t \rightarrow 0} \frac{\pi \sin(\pi t)}{\pi t} = \pi$$

$$(7) \int_{-\infty}^{+\infty} (t^3 + 2t^2 - 2t + 1) \delta'(t-1) dt$$

$$= -(3t^2 + 4t - 2) \Big|_{t=1} = -5$$