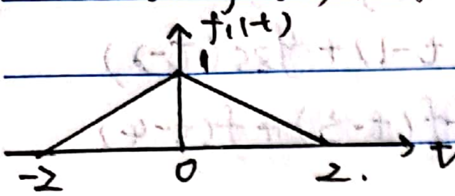
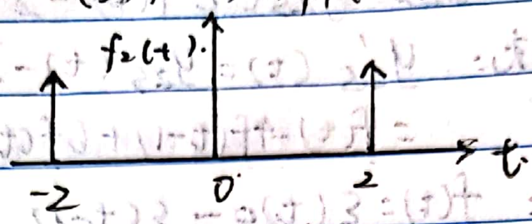
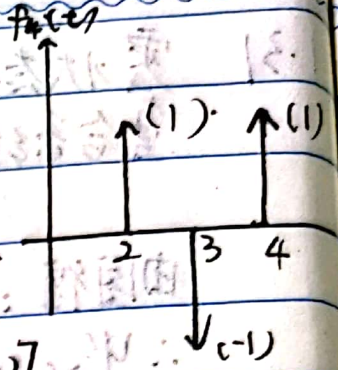
2.16. (1) $f_1(t)*f_2(t)$. (3) $f_1(t)*f_4(t)$.







解：$f_1(t)=\frac{1}{2}[(t+2)\varepsilon(t+2)-2t\varepsilon(t)+(t-2)\varepsilon(t-2)]$

$f_2(t)=\delta(t+2)+\delta(t-2)$

$f_4(t)=\delta(t-2)-\delta(t-3)+\delta(t-4)$.

(1) $f_1(t)*f_2(t)=\int_{-\infty}^{\infty}f_1(\tau)\cdot f_2(t-\tau)\,d\tau$

$=f_1(t+2)+f_1(t-2)$

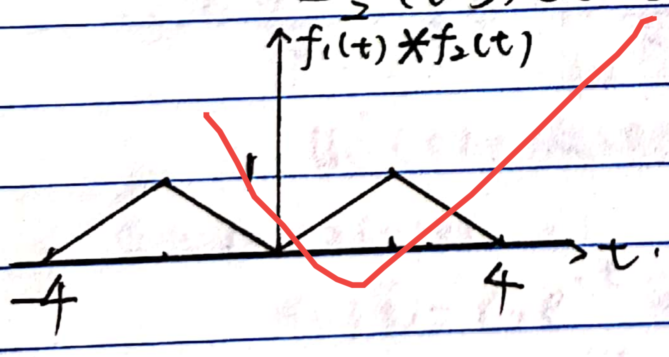
$=\frac{1}{2}(t+4)\varepsilon(t+4)-(t+2)\varepsilon(t+2)+t\varepsilon(t)-(t-2)\varepsilon(t-2)$

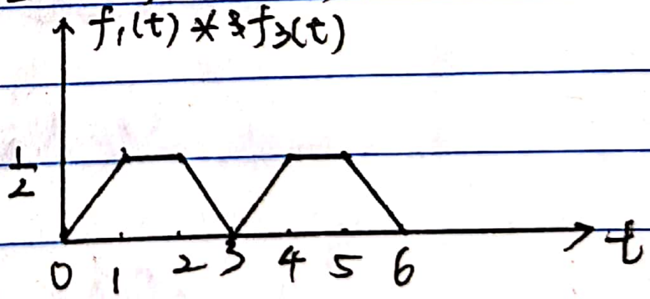
$+\frac{1}{2}(t-4)\varepsilon(t-4)$

(3) $f_1(t)*f_3(t)=\int_{-\infty}^{\infty}f_1(\tau)\cdot f_3(t-\tau)\,d\tau=f_1(t-2)-f_1(t-3)*f_1(t-4)$

$=\frac{1}{2}t\varepsilon(t)-\frac{1}{2}(t-1)\varepsilon(t-1)-\frac{1}{2}(t-2)\varepsilon(t-2)+(t-3)\varepsilon(t-3)-\frac{1}{2}(t-4)\varepsilon(t-4)$

$-\frac{1}{2}(t-5)\varepsilon(t-5)+\frac{1}{2}(t-6)\varepsilon(t-6)$.





2·17. (7) $f_1(t)=\varepsilon(t)-\varepsilon(t-4)$ $f_2(t)=\sin(\pi t)\varepsilon(t)$

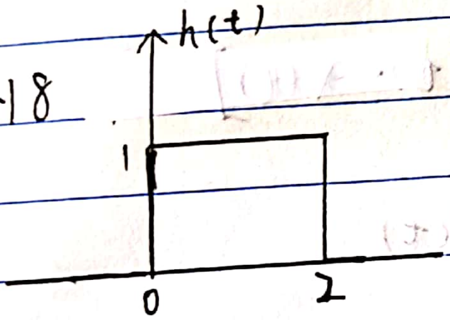
$f_1(t)*f_2(t)=[\varepsilon(t)-\varepsilon(t-4)]*[\sin(\pi t)\varepsilon(t)]$

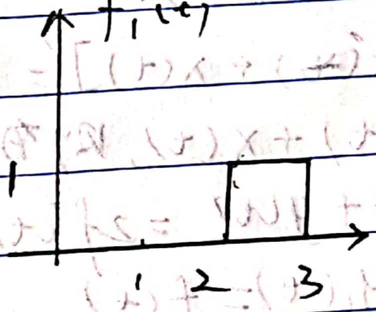
$=[\varepsilon(t)\sin(\pi t)\varepsilon(t)]*[\delta(t)-\delta(t-4)]$

$=\frac{1}{\pi}[1-\cos(\pi t)]\varepsilon(t)*[\delta(t)-\delta(t-4)]$

$=\frac{1}{\pi}[1-\cos(\pi t)][\varepsilon(t)-\varepsilon(t-4)]$

2·18





$h(t)=\varepsilon(t)-\varepsilon(t-2)$

(1) 输入 $\varepsilon(t)$ 时

$y_f(t)=f(t)*h(t)$

$=\varepsilon(t)*\varepsilon(t)*[\delta(t)-\delta(t-2)]$

$=t\varepsilon(t)*[\delta(t)-\delta(t-2)]$

$=t\varepsilon(t)-(t-2)\varepsilon(t-2)$

$=t[\varepsilon(t)-\varepsilon(t-2)]+2\varepsilon(t-2)$

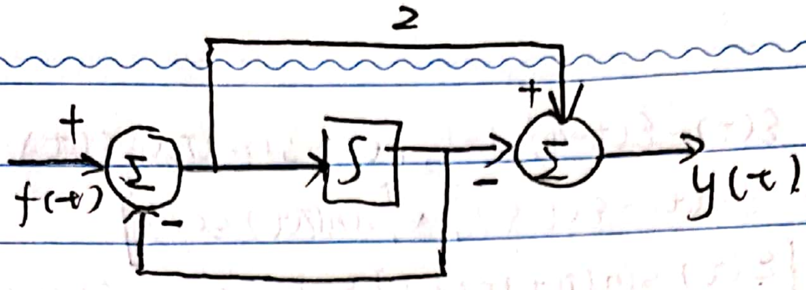
(2) $f_1(t)=\varepsilon(t-2)-\varepsilon(t-3)$

$y_{f_1}(t)=f_1(t)*h(t)$

$=\varepsilon(t)*\varepsilon(t)*[\delta(t-2)-\delta(t-3)]*[\delta(t)-\delta(t-2)]$

$=(t-2)\varepsilon(t-2)-(t-3)\varepsilon(t-3)-(t-4)\varepsilon(t-4)+(t-5)\varepsilon(t-5)$

2.26.



解：
$$\begin{cases} x'(t)=f(t)-x(t) \\ y(t)=2x'(t)-x(t). \end{cases}$$

$\therefore y'(t)=2[x'(t)]'-[x(t)]'$

$y(t)+y'(t)=2[x'(t)+x(t)]'-[x'(t)+x(t)]$

考虑式 $f(t)=x'(t)+x(t)$，则有

$y'(t)+y(t)=2f'(t)-f(t)$

设 $y_1'(t)+y_1(t)=f(t)$

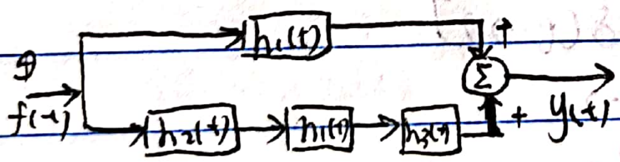
设其冲激响应 $h_1(t)$. $h_1(0_+)=1$

$h_1(t)=e^{-t}\varepsilon(t)$

$\therefore$ 系统：$h(t)=2h_1'(t)-h_1(t)$

$=2\delta(t)-3e^{-t}\varepsilon(t)$.

2.30.



令 $f(t)=\delta(t)$

$h_1(t)=y_1(t)=f(t)*h_1(t)=\delta(t)*\varepsilon(t)=\varepsilon(t)$

$h_2(t)=y_2(t)=f(t)*h_2(t)*h_1(t)*h_3(t)$

$=\delta(t)*\delta(t-1)*\varepsilon(t)*[-\delta(t)]$

$=-\varepsilon(t-1)$

$h(t)=h_1(t)+h_2(t)=\varepsilon(t)-\varepsilon(t-1)$