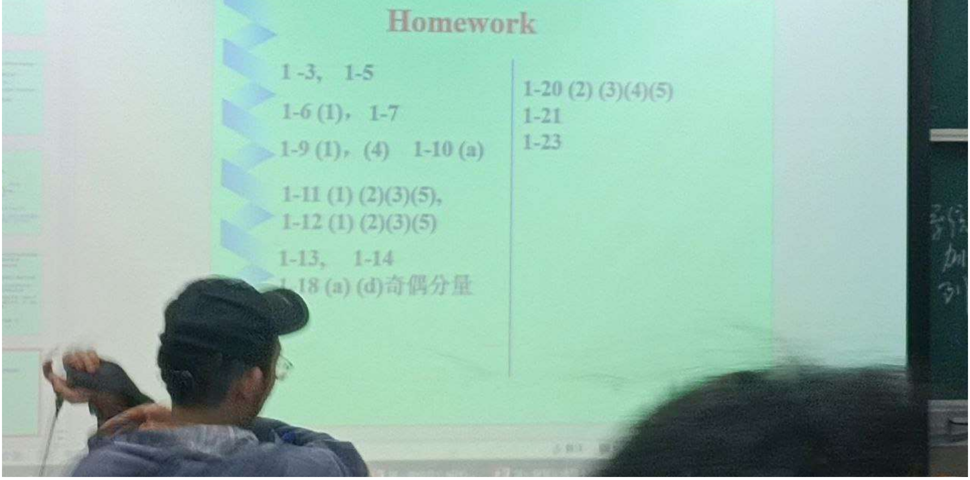


1-3 求T.

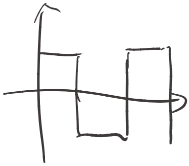
(1) $\cos 10t - \cos 30t = -2\sin 20t \sin(-10t)$

$T = \frac{2\pi}{W_m} = \frac{\pi}{10}$ s.

(2) e^{j10t} $T = \frac{2\pi}{W} = \frac{\pi}{5}$ s.

(3) $5\sin^2 8t$ $T = \frac{\pi}{W} = \frac{\pi}{8}$ s.

(4) $\sum_{n=0}^{\infty}(-1)^n[u(t-nT)-u(t-nT-T)]$（$n$ 为正整数）



$T' = 2T$.

1-5

1－5 已知 $f(t)$，为求 $f(t_0-at)$ 应按下列哪种运算求得正确结果（式中 t_0，a 都为正值）？

(1) $f(-at)$ 左移 t_0

(2) $f(at)$ 右移 t_0

(3) $f(at)$ 左移 $\frac{t_0}{a}$

(4) $f(-at)$ 右移 $\frac{t_0}{a}$

1－6 绘出下列各信号的波形。

(1) $\left[1+\frac{1}{2}\sin(\Omega t)\right]\sin(8\Omega t)$

~~(2) $[1+\sin(\Omega t)]\sin(8\Omega t)$~~

1－7 绘出下列各信号的波形。

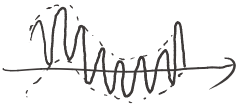
(1) $[u(t)-u(t-T)]\sin\left(\frac{4\pi}{T}t\right)$

(2) $[u(t)-2u(t-T)+u(t-2T)]\sin\left(\frac{4\pi}{T}t\right)$

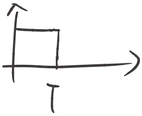
1-6 (1) $1+\frac{1}{2}\sin(\Omega t)$

$\sin(8\Omega t)$

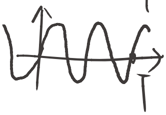
$\left[1+\frac{1}{2}\sin(\Omega t)\right]\sin(8\Omega t)$



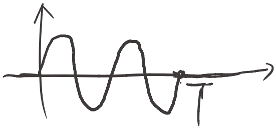
1-7 (1) $u(t)-u(t-T)$



$\sin\left(\frac{4\pi}{T}t\right)$

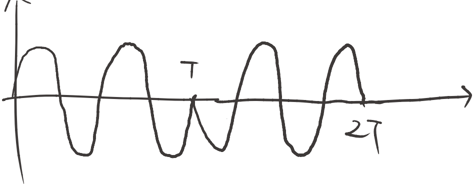


$\therefore [u(t)-u(t-T)]\sin\left(\frac{4\pi}{T}t\right) =$



(2) $u(t)-2u(t-T)+u(t-2T)$

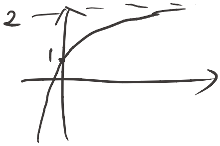
$\left[u(t)-2u(t-T)+u(t-2T)\right]\sin\left(\frac{4\pi}{T}t\right)$



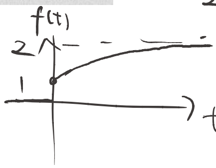
1-9

(1) $f(t)=(2-e^{-t})u(t)$

$2-e^{-t}$



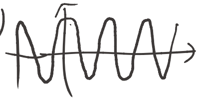
$f(t)$



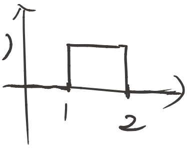
(4) $f(t)=e^{-t}\cos(10\pi t)[u(t-1)-u(t-2)]$

e^{-t}

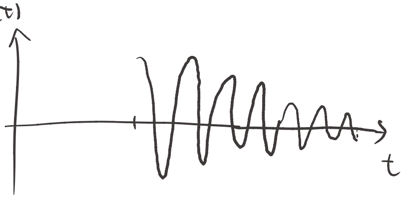
$\cos(10\pi t)$



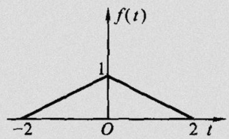
$u(t-1)-u(t-2)$



$f(t)$



1-10



(a)

$$f(t)=\begin{cases}1+\frac{1}{2}t, & t\in(-2,0)\\ 1-\frac{1}{2}t, & t\in[0,2)\\ 0, & t\in \text{other}\end{cases}$$

$$f(t)=[u(|t|)-u(|t|-2)](1-\frac{|t|}{2})$$

1-11 绘出下列各时间函数的波形图。

(1) $te^{-t}u(t)$

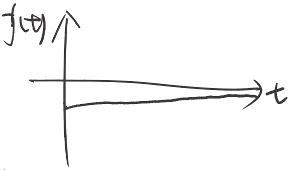
(2) $e^{-(t-1)}[u(t-1)-u(t-2)]$

(3) $[1+\cos(\pi t)][u(t)-u(t-2)]$

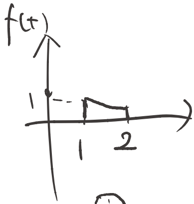
~~(4) $u(t)-2u(t-1)+u(t-2)$~~

(5) $\dfrac{\sin[a(t-t_0)]}{a(t-t_0)}$

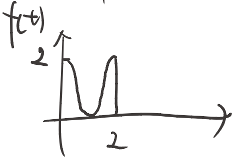
(1)



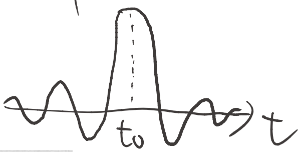
(2)



(3)



(5)



1－12 绘出下列各时间函数的波形图，注意它们的区别。

(1) $t[u(t)-u(t-1)]$

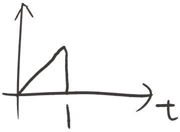
(2) $t\cdot u(t-1)$

(3) $t[u(t)-u(t-1)]+u(t-1)$

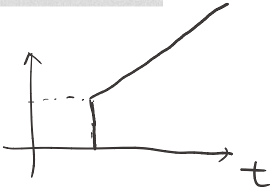
~~(4)~~ $\cancel{(t-1)u(t-1)}$

(5) $-(t-1)[u(t)-u(t-1)]$

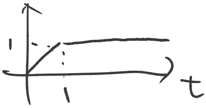
(1)



(2)



(3)



(5)

1－13 绘出下列各时间函数的波形图，注意它们的区别。

(1) $f_1(t)=\sin(\omega t)\cdot u(t)$

(2) $f_2(t)=\sin[\omega(t-t_0)]\cdot u(t)$

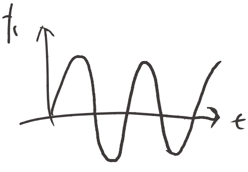
(3) $f_3(t)=\sin(\omega t)\cdot u(t-t_0)$

(4) $f_4(t)=\sin[\omega(t-t_0)]\cdot u(t-t_0)$

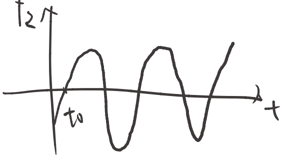
1－14 应用冲激信号的抽样特性，求下列表示式的函数值。

(1) $\int_{-\infty}^{\infty} f(t-t_0)\delta(t)\mathrm{d}t$

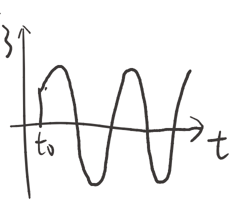
1-13 (1)



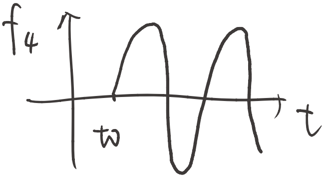
(2)



(3)



(4)



1-14 (1) $= f(0-t_0) = f(-t_0)$

(2) $\int_{-\infty}^{\infty} f(t_0 - t)\delta(t)\mathrm{d}t = f(t_0)$

(3) $\int_{-\infty}^{\infty} \delta(t - t_0)u\left(t - \frac{t_0}{2}\right)\mathrm{d}t = u\left(\frac{t_0}{2}\right)$

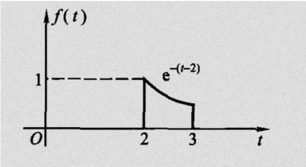
(4) $\int_{-\infty}^{\infty} \delta(t - t_0)u(t - 2t_0)\mathrm{d}t = u(-t_0)$

(5) $\int_{-\infty}^{\infty} (e^{-t} + t)\delta(t + 2)\mathrm{d}t = e^2 - 2$

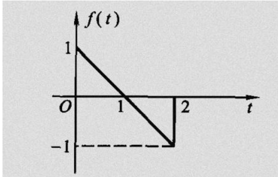
(6) $\int_{-\infty}^{\infty} (t + \sin t)\delta\left(t - \frac{\pi}{6}\right)\mathrm{d}t = \frac{\pi}{6} + \frac{1}{2}$

(7) $\int_{-\infty}^{\infty} e^{-j\omega t}[\delta(t) - \delta(t - t_0)]\mathrm{d}t = 1 - e^{-jwt_0}$

1-18



(a)



(d)

$$f(t) = [u(t-2) - u(t-3)]e^{-(t-2)}$$

$$f_e(t) = \frac{1}{2}[f(t) + f(-t)]$$

$$= \frac{1}{2}[u(t-2) - u(t-3)]e^{-t+2}$$

$$+ \frac{1}{2}[u(-t-2) - u(-t-3)]e^{t+2}$$

$$f_o(t) = \frac{1}{2}[f(t) - f(-t)]$$

$$= \frac{1}{2}[u(t-2) - u(t-3)]e^{-t+2}$$

$$- \frac{1}{2}[u(-t-2) - u(-t-3)]e^{t+2}$$

$$f(t) = [u(t) - u(t-2)](1-t)$$

$$f_e(t) = \frac{1}{2}[f(t) + f(-t)]$$

$$= \frac{1}{2}[u(t) - u(t-2)](1-t)$$

$$+ \frac{1}{2}[u(-t) - u(-t-2)](1+t)$$

$$f_o(t) = \frac{1}{2}[f(t) - f(-t)]$$

$$= \frac{1}{2}[u(t) - u(t-2)](1-t)$$

$$- \frac{1}{2}[u(-t) - u(-t-2)](1+t)$$

L T C

1－20 判断下列系统是否为线性的、时不变的、因果的。

(1) $\cancel{r(t) = \frac{de(t)}{dt}}$

(2) $r(t) = e(t)u(t)$ LTC

(3) $r(t) = \sin[e(t)]u(t)$ TC

(4) $r(t) = e(1-t)$ T

(5) $r(t) = e(2t)$ LC

(6) $r(t) = e^2(t)$ TC

(7) $r(t) = \int_{-\infty}^{t} e(\tau)d\tau$ LTC

(8) $r(t) = \int_{-\infty}^{5t} e(\tau)d\tau$ LC

1－21 判断下列系统是否是可逆的。若可逆，给出它的逆系统；若不可逆，指出使该系统产生相同输出的两个输入信号。

(1) $r(t)=e(t-5)$ √. $r_2(t)=e_2(t+5)$

(2) $r(t)=\frac{d}{dt}e(t)$ √. $r_2(t)=\int_{-\infty}^{t}e(\tau)dt$

(3) $r(t)=\int_{-\infty}^{t}e(\tau)d\tau$ √ $r_2(t)=\frac{de(t)}{dt}$

(4) $r(t)=e(2t)$ √

$r_2(t)=e(\frac{1}{2}t)$

1－23 有一线性时不变系统，当激励 $e_1(t)=u(t)$ 时，响应 $r_1(t)=e^{-\alpha t}u(t)$，试求当激励 $e_2(t)=\delta(t)$ 时，响应 $r_2(t)$ 的表示式。（假定起始时刻系统无储能。）

由微分特性.

$$r_2(t)=\frac{dr_1(t)}{dt}=-\alpha e^{-\alpha t}u(t)+e^{-\alpha t}\delta(t)$$

$$=-\alpha e^{-\alpha t}u(t)+\delta(t).$$