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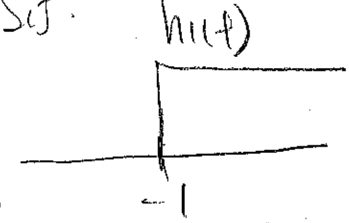
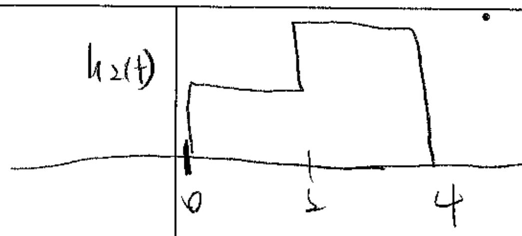
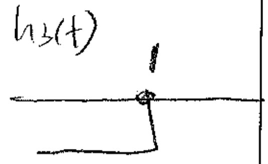


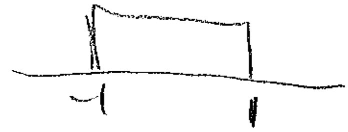


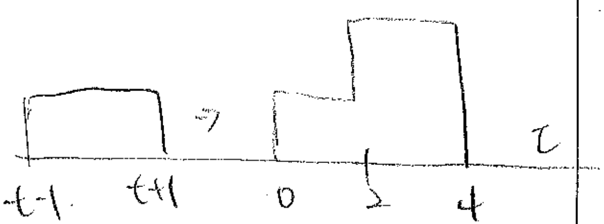


$(h_2 * h_3) + (h_1 * h_2)$

$h_2(h_3 + h_1) \Rightarrow h_2 * (h_3 + h_1)$

$h_3 + h_1 = h_4(t)$





$t+1=0,\ t=-1.\ \uparrow$

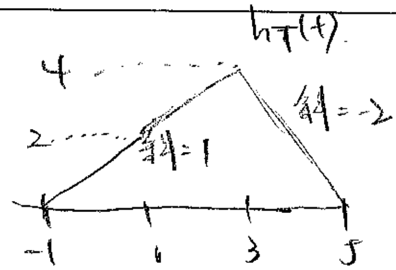
$t+1 = 2,\ t=1.$ Area=2

$t+1>2,\ t>1.\ \uparrow\uparrow$

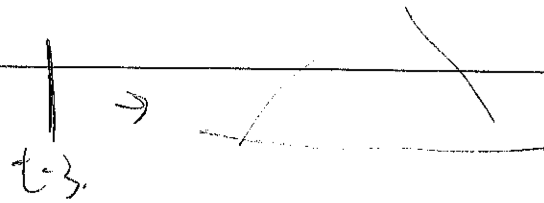
$\Rightarrow \int_2^{t+1} 1\, dt = 4.$

$h_4(t).\ t+1=4,\ t=3 \rightarrow 4$

$t-1>4,\ t>5.\ \Rightarrow 0$



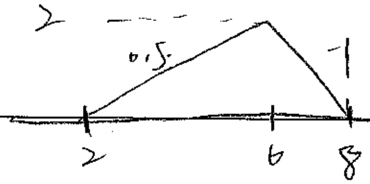
$x(t) * h_T(t) = y(t)$



$t-3=-1$

$t=2.$

→ 右移



An Yes

Yes.

家長簽名：

2

第 課

25

$x(t) = e^{-t}u(t)$ $h(t) = \cancel{e^{t}} e^{-t}u(t)$.

$X[0] = \int_0^\infty e^{-t} \, dt$

$\int_0^\infty e^{-t} e^{-j\omega t} \, dt$.

$\int_0^\infty e^{-t(1+j\omega)} \, dt$

$\rightarrow \frac{1}{1+j\omega} = X(j\omega) = H(j\omega)$.

$\cancel{\frac{1}{2\pi}\int_{-\infty}^{\infty} \frac{1}{1+j\omega} dt}$.

$\int_0^\infty e^{-t} \, dt$.

$\cancel{\frac{1}{-1}\, e^{-\infty} - e^{0}} = \frac{1}{-1}$
$\cancel{(0-1)}$

又. $Y(j\omega) = H(j\omega) \cdot X(j\omega)$
$= \frac{1}{(1+j\omega)^2}$

$\cancel{\frac{-j}{(1+j\omega)^2}}$

又. let Z $\frac{dZ(j\omega)}{d\omega} = Y(j\omega)$. $\rightarrow$ $Z(j\omega) = \frac{j}{1+j\omega}$

$z(t) = j \cdot e^{-t}u(t)$

又. $\frac{dZ(j\omega)}{d\omega} \rightarrow -jt\,z(t) \Leftarrow Y(j\omega)$

$y(t)$ $+$

$y(t) = -jt\,z(t)$

$t \cdot e^{-t}u(t)$
$\#$

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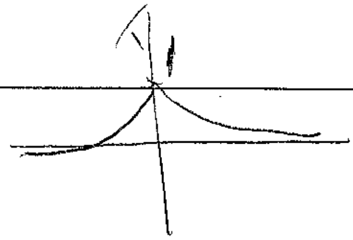
$$\frac{1}{2\pi}\int_{-\infty}^{\infty} j\omega X(j\omega)\, e^{j\omega t}\Big|_{t=0}\, d\omega = \frac{1}{2\pi}\int_{-\infty}^{\infty} j\omega X(j\omega)\, d\omega$$

$$\frac{1}{2\pi}\left[\int_{-1}^{0} \omega\sqrt{\pi}\, d\omega - \int_{0}^{1} (-1)\cdot\sqrt{\pi}\, d\omega\right].$$

$$\frac{\sqrt{\pi}}{2}\omega^2\Big|_{-1}^{0} - \frac{\sqrt{\pi}}{2}\omega^2\Big|_{0}^{1}$$

$$-\frac{\sqrt{\pi}}{2} - \frac{\sqrt{\pi}}{2} = -\sqrt{\pi}\times\frac{1}{2\pi} = \frac{-1}{2\sqrt{\pi}}$$

2.18



$$\int_{-\infty}^{0} e^{at} e^{-j\omega t}\, dt + \int_{0}^{\infty} e^{-at} e^{-j\omega t}\, dt$$

$$\int_{-\infty}^{0} e^{t(a-j\omega)}\, dt \qquad \int_{0}^{\infty} e^{-t(a+j\omega)} \qquad \frac{-1}{(a+j\omega)}(0-1)$$

$$\frac{1}{a-j\omega}(1-0) + \frac{1}{a+j\omega}$$

$$\frac{1}{a-j\omega} + \frac{1}{a+j\omega} \qquad \frac{a+j\omega + a-j\omega}{(a+j\omega)(a-j\omega)} = \frac{2a}{a^2-(j\omega)^2}$$

$$= \frac{2a}{a^2+\omega^2}$$

家長簽名：

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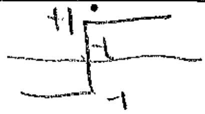
第 課

已知 $u(t)$.

$= \frac{1}{2} + \frac{1}{2}\mathrm{sgn}(t)$

$\mathrm{sgn} =$



又 $\frac{d\,\mathrm{sgn}(t)}{dt} = 2\delta(t)$.

$\xrightarrow{F.T} S(j\omega)\cdot j\omega = 2$

$S(j\omega) = \frac{2}{j\omega}$

又 $1 \xrightarrow{F.T} 2\delta(j\omega)\pi$

$\frac{1}{2}[1+\mathrm{sgn}(t)]$

$\xrightarrow{F.T} \cancel{\frac{1}{2}}\left(\cancel{2}\pi\delta(j\omega) + \frac{\cancel{2}}{j\omega}\right)$

$= \left[\pi\delta(j\omega) + \frac{1}{j\omega}\right] = H(j\omega)$.

$Y(j\omega) = X(j\omega)\cdot H(j\omega) \xrightarrow{I.F.T} x(t) * h(t)$.

又 $x(t) \xrightarrow{F.T} \cancel{X(j\omega)} = X(j\omega)$

$\rightarrow \left[\pi\delta(j\omega) + \frac{1}{j\omega}\right] X(j\omega)$.

$\rightarrow \frac{X(j\omega)}{j\omega} + \pi\delta(j\omega)X(0)$

$X(0) = \int_{-\infty}^{\infty} x(t)\cdot e^{-j\omega t}\big|_{\omega=0}\,dt$

$= \int_{-\infty}^{\infty} x(t)\,dt$

2.16

$1 \rightarrow 2\pi\delta(j\omega)$

$\leftarrow 1$

$\cancel{2\pi\delta(t)}$

$\delta(t) \rightarrow 1$

$\delta(t) \leftarrow 1$

家長簽名：

第

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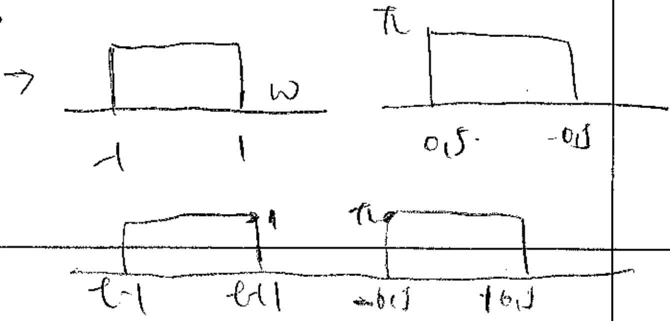
2.12

$\frac{\sin(t)}{\pi t} \cdot \frac{\sin(0.5t)\pi}{t \cdot \pi}$



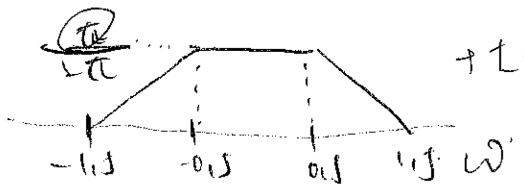
$t-1 = 0.5,\ t = 0.5$ Max

$t+1 = -0.5,\ t = -1.5$ ↑

until $t-1 = -0.5.\ t = 0.5$

$t-1 = 0.5,\ t = 1.5 \to 0$

$\pi \cdot \int_{-0.5}^{\infty} \pi \cdot 1\, dt$



2.13

$\int$ $y(t) = x(t) * h(t)$

$\int_0^{\infty} e^{-at} \cdot e^{-j\omega t}\, dt$

$e^{-t(a+j\omega)}\, dt$

$\frac{1}{a+j\omega} = X(j\omega) = H(j\omega)$

$H(j\omega) = \frac{1}{b+j\omega}$

$Y(j\omega) = \frac{1}{(a+j\omega)^2}$ $\quad \frac{dy(t)}{dt} = Y(j\omega)\, j\omega$

$\frac{dZ(j\omega)}{d\omega} = Y(j\omega) = j\omega \to -jt$

$Z(j\omega) = \frac{j}{a+j\omega}$ $\quad -j(\cancel{-j})$ $\quad \frac{1}{(a+j\omega)^2}$

$z(t) = j \cdot e^{-at} u(t)$

$z(t) \to Z(j\omega)$

$\frac{dz(t)}{dt}$ $\quad j\omega Z(j\omega)$

$\cancel{jt} \cdot j e^{-a}$

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家長簽名：

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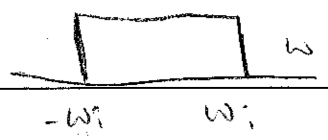
課

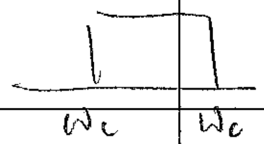
$x(t) = \frac{\sin(w_i t)}{\pi t}$ $h(t) = \frac{\sin(w_c t)}{\pi t}$

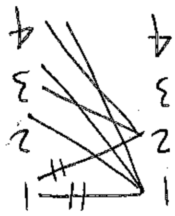
$Y(t) = x(t) * h(t)$

$X(jw)$

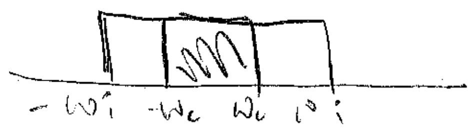


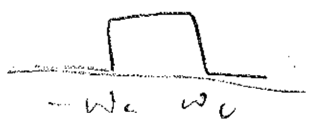
$H(jw)$





if $(w_i > w_c)$





if $(w_i > w_c)$

~~sin~~

$\frac{\sin(w_c t)}{\pi t}$

11/sc if $(w_i < w_c)$

$\frac{\sin(w_i t)}{\pi t}$

家長簽名：

第

課

$$\int_0^{\infty} e^{-bt} \cdot e^{-j\omega t}\, dt$$

$$e^{-t(b+j\omega)}\, dt$$

$$\frac{-1}{j\omega+b}(e^{0}-1) = \frac{1}{j\omega+b} = X(j\omega) \,,\; H(j\omega) = \frac{1}{j\omega+a}$$

$$Y(j\omega) = H(j\omega)\cdot X(j\omega) = \frac{1}{(j\omega+b)} \cdot \frac{1}{(j\omega+a)}$$

$$\rightarrow \frac{A}{j\omega+b} + \frac{B}{j\omega+a} = \frac{1}{(j\omega+b)(j\omega+a)}$$

$$A(j\omega+a) + B(j\omega+b) = 1$$

$$B(b-a) = 1$$

$$B = \frac{1}{b-a}$$

$$A(a-b) = 1 \,,\; A = \frac{1}{a-b}$$

$$= \frac{1}{a-b}\left(\frac{1}{j\omega+b}\right) - \frac{1}{a-b}\left(\frac{1}{j\omega+a}\right)$$

$$\frac{1}{a-b}\left[e^{-bt}u(t) - e^{-at}u(t)\right]$$

家長簽名：

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P. #4

$x(t) * h(t) = \frac{dx(t)}{dt}$

$X(j\omega)\,\underline{H(j\omega)} = X(j\omega)\cdot j\omega$

$\underline{H(j\omega) = j\omega}$

2.15

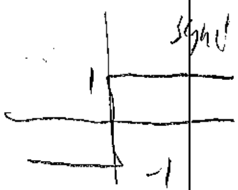
$\underline{y(t) = \int_{-\infty}^{t} x(\tau)\,d\tau}$

$= \int_{-\infty}^{\infty} x(\tau)\,\underline{u(t-\tau)}\,d\tau$

$u(t)$

$\rightarrow Y(j\omega) = X(j\omega)\cdot \underline{U(j\omega)}$

$\frac{1}{2} + \frac{1}{2}\,\mathrm{sgn}(t)$



$\frac{dy(t)}{d(t)} = \delta\,Y$

$\frac{d(\mathrm{sgn}(t))}{dt} = 2\delta(t)$

$S(j\omega) = \frac{2}{j\omega}$

又 $1 \xrightarrow{F.T} \delta(t)$ $\left(\frac{\pi\delta(j\omega)}{2} + \frac{1}{2}\right)X(j\omega)$

$\frac{1}{2}\left(\ \frac{1}{j\omega} + \delta(\right.$

$\delta(t) \xrightarrow{F.T} 1$ $\frac{1}{2}\Big($

$\frac{X(j\omega)}{2}\left[\frac{\pi\delta(j\omega)}{2} + j\omega\right]$

$1 \rightarrow \pi\delta(j\omega)$

第 課

家長簽名：

2.17

$$\frac{1}{2\pi}\int_{-\infty}^{\infty}|X(j\omega)|^2 d\omega$$

$$\rightarrow \frac{1}{2\pi}\left[\int_{-1}^{-0.5}(\sqrt{\pi}^2)dt + \int_{-0.5}^{0.5}\frac{\pi}{4}dt + \int_{0.5}^{1}\pi\, dt\right]$$

$$\rightarrow \frac{1}{2\pi}\left(\cancel{(0.5\pi)}\pi + \frac{\pi}{4} + \cancel{0.5\pi}\right)$$

$$\frac{5}{4}\pi \times \frac{1}{2\pi} = \frac{5}{8} \quad 1.(a).$$

$$\frac{1}{2\pi}\int_{-\infty}^{\infty}|X(t)|^2 dt \qquad \cdot\sqrt{\pi}\times\sqrt{\pi} = \pi$$

$$\frac{1}{2\pi}\left[\int_{-1}^{0}\pi\, dt + \int_{0}^{1}\pi\, dt\right]$$

$$\frac{1}{2\pi}(\pi+\pi) = 1 \quad (b)$$

D.

$$\frac{1}{2\pi}\int_{-\infty}^{\infty} j\omega \cdot X(j\omega)\, d\omega$$

$$\frac{1}{2\pi}\left[\int_{-1}^{-0.5} j\omega\cdot\sqrt{\pi}\, d\omega + \int_{-0.5}^{0.5}\frac{\sqrt{\pi}}{2} j\omega \cdot d\omega + \int_{0.5}^{1} j\omega\sqrt{\pi}\, d\omega\right]$$

$$\frac{j\sqrt{\pi}}{2}\omega^2\Big|_{-1}^{-0.5} + \frac{j\sqrt{\pi}}{4}\omega^2\Big|_{-0.5}^{0.5} + \frac{j\sqrt{\pi}}{2}\omega^2\Big|_{0.5}^{1}$$

$$\cancel{\frac{j\sqrt{\pi}}{2}\cdot(0.5)^2} - \cancel{\frac{j\sqrt{\pi}}{2}(1)^2}\quad \cancel{(0.5)^2\cdot 17 - (0.5)^2}\ \square + \cancel{\frac{j\sqrt{\pi}}{2}\cdot(1)^2}$$

$$- \cancel{\frac{j\sqrt{\pi}}{2}(0.5)^2}$$

$$D \qquad = 0$$

第

課

1. $\frac{dy(t)}{dt} + a y(t) = x(t)$, $a > 0$

$j\omega Y(j\omega) + a Y(j\omega) = X(j\omega)$.

$Y(j\omega) = \frac{X(j\omega)}{a + j\omega} \rightarrow y(t) = h(t) * x(t)$.

$X(j\omega) \cdot H(j\omega)$

$\frac{1}{a+j\omega} \cdot X(j\omega)$.

又 $H(j\omega) = \frac{1}{a + j\omega}$

2.2

$(j\omega)^2 Y(j\omega) + 4(j\omega)Y(j\omega) + 3Y(j\omega) = j\omega(X(j\omega)) + 2X(j\omega)$.

$(j\omega^2 + 4j\omega + 3)Y(j\omega) = 2X(j\omega) + j\omega X(j\omega)$

$Y(j\omega) = \frac{j\omega X(j\omega) + 2X(j\omega)}{(j\omega+3)(j\omega+1)}$ $\quad \frac{A}{j\omega+3} + \frac{B}{j\omega+1}$

$(j\omega+1)A + (j\omega+3)B = j\omega X(j\omega) + 2X(j\omega)$.

$(j\omega+2)X(j\omega)$

$2B = 1$

$B = \frac{1}{2}$

$-2A = -1$

$A = \frac{1}{2}$

$\frac{1}{2}\left(\frac{1}{j\omega+3} + \frac{1}{j\omega+1}\right)$ //

家長簽名：

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2.4.

第　課

$$V_o(j\omega) = \frac{1}{RC}\left[V_i(j\omega) - V_o(j\omega)\right]$$

$$\cancel{\left(\frac{1}{RC}+1\right)V_o(j\omega) = \frac{V_i(j\omega)}{RC}}$$

$$\cancel{V_o(j\omega) = \frac{1}{\tau}\left[\frac{1}{j\omega}+\pi\delta(j\omega)\right] \times \left(1+\frac{t}{\tau}\right)}$$

$\frac{1}{2}+\frac{1}{2}\,sgn(t)$

$= u(t) \Rightarrow U(j\omega)\ \frac{d\,sgn(t)}{dt} = 2\delta(t)$

$\cancel{S}(j\omega)$

$j\omega S(j\omega) = \frac{2}{j\omega}$

$\frac{1}{j\omega} + \pi\delta(j\omega)$

$$V_o(j\omega) = \left(\frac{1}{\tau}+\frac{1}{\tau\omega}\right)\left(\frac{1}{j\omega}\right)$$

$$j\omega V_o(j\omega) = \frac{1}{\tau}\left(V_i(j\omega) - V_o(j\omega)\right)$$

$$\frac{1}{\tau}\left(V_o(j\omega)+j\omega\tau V_o\right) = \frac{V_i(j\omega)}{\tau}$$

$$V_o(j\omega)\left(\frac{1}{\tau}+j\omega\right) = \qquad \frac{1+j\omega\tau}{\tau}$$

$$V_o(j\omega) = \frac{V_i(j\omega)}{\tau} \times \frac{\tau}{1+j\omega\tau} = \frac{V_i(j\omega)}{1+j\omega\tau}$$

$V_o(t) = V_i(t) \times h(t)$　$\frac{-1}{\tau}+\frac{G}{\tau}$

$\int_{-\infty}^{\infty}$

$\cancel{\int_0^{\infty}\frac{1}{\tau}e^{\frac{-1}{\tau}(t-G)}\,dG}$

$\frac{1}{\tau}\cdot\frac{1}{\tau}\cdot h(t)\cdot u(t)$

又 $V_o(j\omega) = V_i(j\omega)\cdot H(j\omega)$

$$H(j\omega) = \frac{1}{1+j\omega\tau}$$

$$\frac{1}{\tau}\cdot\frac{1}{\frac{1}{\tau}+j\omega}$$

$$h(t) = \frac{1}{\tau}\cdot e^{\frac{-1}{\tau}t}\,u(t)$$

$$\int \frac{1}{RC}e^{\frac{-1}{RC}(t)}\,u(t-\tau)\,d\tau$$

$$\frac{1}{RC}\int_{-\infty}^{t} e^{\frac{-\tau}{RC}}\,d\tau$$

$\frac{-1}{RC}(t+\infty)$

$\frac{1}{RC}\int e^{\frac{-t}{RC}} =$

24

家長簽名：

1) $f(y) = \frac{y^2}{2} + y \cdot \frac{1}{2}$

$f'(y) = y + 1 \quad 1 + y^2 + 2y + 1$

$\int_{-1}^{3} \sqrt{y^2 + 2y + 2}\, dy \quad u = y^2 \quad 2\sqrt{u}$

$\frac{du}{dy} = 2y$

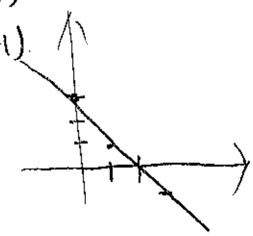
$\frac{du}{2y} = dy$

$= \ ?$

2) $y = 3 - 2x \quad (0, 3)$

$(2, -1)$

$y' = -2$



$\int_0^x \sqrt{1+4}\, dx$

$\sqrt{5} \cdot x \Big|_0^x \quad \sqrt{4+16} = 2\sqrt{5}$

$= \sqrt{5}x$

3) $\frac{dy}{dx} = \sqrt{\cos 2\theta} \quad x \quad \cos 2\theta = 2\cos^2\theta - 1$

$L = \int_0^x \sqrt{1 + (\frac{dy}{dx})^2}\, d\theta = \int_0^x \sqrt{1 + \cos 2\theta}\, d\theta$

$= \int_0^{\frac{\pi}{4}} \sqrt{1 + 2\cos^2\theta - 1}\, d\theta = \int_0^{\frac{\pi}{4}} \sqrt{2}\sqrt{\cos^2\theta}\, d\theta$

$\sqrt{2} \int_0^{\frac{\pi}{4}} |\cos\theta|\, d\theta = \sqrt{2}\sin\theta \Big|_0^{\frac{\pi}{4}}$

$h(t) = \frac{1}{\tau} \times e^{-\frac{t}{\tau}} \quad u(t)$

$v_0 = \quad \cancel{\int v_i(\tau) \cdot h(\tau - t)\, d\tau}$

$v_0 = \underline{v_i(t) * h(t)} \rightarrow$

$\frac{1}{\tau} \int_0^t e^{-\frac{t}{RC}} \cdot u(t-\tau)\, d\tau \quad (t-\tau)$

$\cancel{u(t)}$

$\sqrt{2}\left(\frac{\sqrt{2}}{2} - 0\right) = \frac{1}{\cancel{\pi}}$

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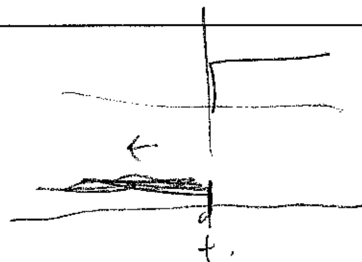
#21 chen



$\frac{1}{RC} \int_0^t e^{-\frac{\tau}{RC}} \cdot d\tau$

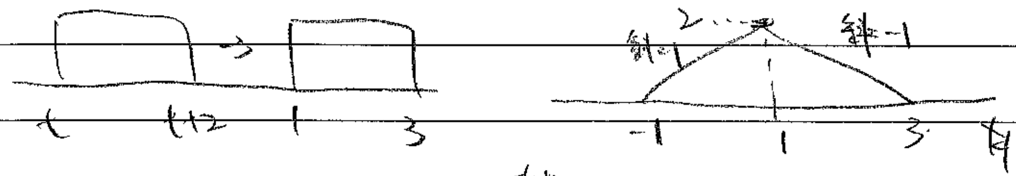
$e^{-\frac{\tau}{RC}} \cancel{\theta} \Big|_0^t$

$\frac{1}{RC} \times RC$

第　　課

家長簽名：

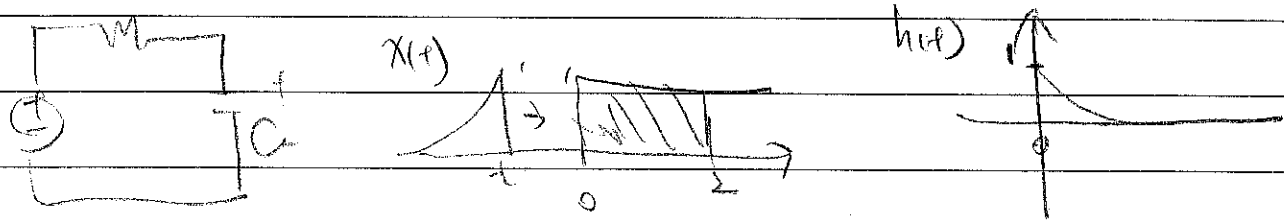
2.1



$t+2=1,\ t=-1$ $\int_1^3 1\cdot 1\,dt = 2$

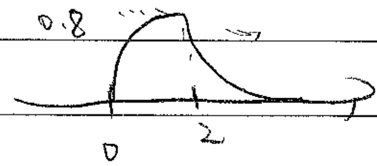
$t=3$ $t+2=3,\ t=1$

2.2 R



$\int_0^t e^{-t}\,dt$ $t=0$, ↑ $\left\{ 1-e^{-t},\ t<2 \right.$

$t=0\sim 2$, ↑



$\frac{1}{-1}(e^{-t}-1)$ $t>2$ ↓

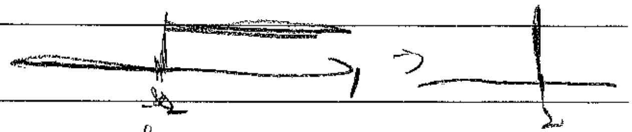
$=1-e^{-t}$ $\int_0^2 e^{-t}\,dt = (e^{-2}-1) = 0.8$

2.3.

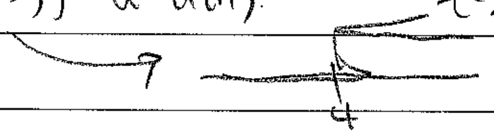
$[(h_1+h_2)*h_3]-h_4$

$\cancel{u(n)}+u(n+2)-u(n)$

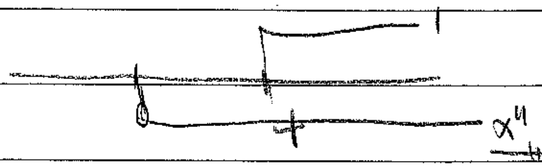
$[u(n+2)*\delta(n-2)]-\alpha^n u(n)$



$t-2$



$t-2=2$
$t=4$



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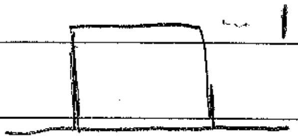
2.8 $x(t) \to X(j\omega)$

$y(t) = x(t-t_0)$.

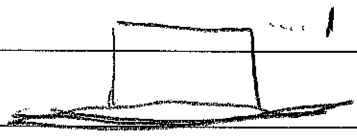
$Y(j\omega) = X(j\omega)\cdot e^{-j\omega t_0}$

2.9



$\cdots 1$ $\quad rect(j\omega) = X_1$

$-0.5 \quad 0.5$



$\cdots 1$ $\quad rect\left(\frac{j\omega}{2}\right)$.

$-1 \quad 1$

$\frac{1}{2\pi}\int_{-0.5}^{0.5} 1\cdot e^{j\omega t} d\omega$ $\qquad$ $\frac{1}{2\pi}\int_{-1}^{1} e^{j\omega t} d\omega$

$\frac{-1}{2\pi jt}\left(e^{-j0.5t} - e^{j0.5t}\right)$ $\qquad$ $\frac{-1}{2\pi jt}\left(e^{-jt} - e^{jt}\right) = \frac{\sin(t)}{\pi t}$

$\hookrightarrow \frac{\sin(0.5t)}{\pi t}$

2.10 $x(t) = e^{-bt}u(t)$ $\quad h = e^{-at}u(t)$ $\qquad Y(j\omega) = \frac{1}{(j\omega)^2}$

$x(t) * h(t) = y(t)$ $\qquad \int_0^\infty e^{-bt}\cdot e^{-j\omega t} dt$ $\qquad$ let. $\frac{dz(t)}{d}$ $\quad \frac{dy(t)}{dt} = j\omega\cdot\frac{1}{j\omega^2}$

$X(j\omega)H(j\omega) = Y(j\omega)$ $\qquad \frac{dy(t)}{dt} = \frac{1}{j\omega}$

$\frac{-1}{j\omega}\left(e^{-t(b+j\omega)}\Big|_0^\infty\right)$ $\qquad y(t) = \int$ $\quad 0\ j\cdot j$

$= \frac{-1}{j\omega}(0-1) = \frac{1}{j\omega}$ $\qquad Z(j\omega) = \frac{dZ(j\omega)}{d\omega} = Y(j\omega)$

$\frac{-1}{j(b+j\omega)}$ $\quad \frac{1}{b+j\omega}$ $\qquad Z(j\omega) = \frac{+j}{j\omega}$ $\quad +j \quad \frac{-1}{(j\omega)^2}$

$Z(j\omega) = \frac{j}{j\omega}$.

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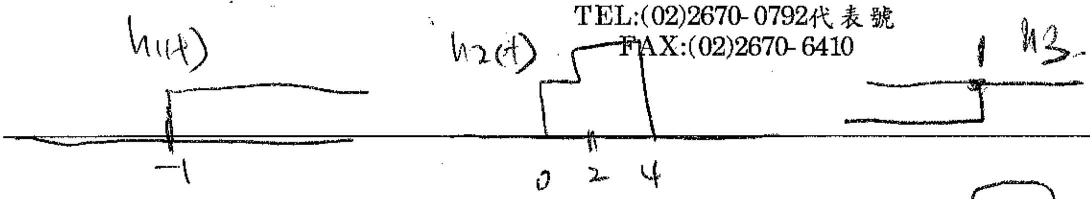
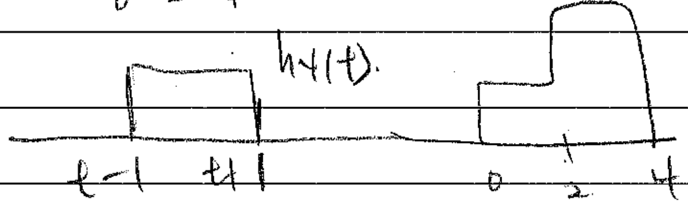
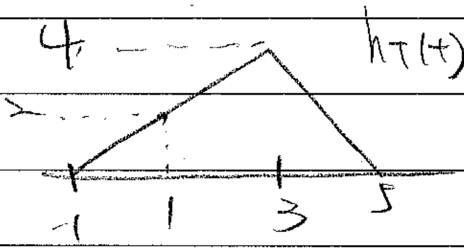
2-17
2-15
2.6
2-10
2.4



$\underbrace{h_2 * (h_1 + h_3)}_{h_4}$





$t+1=0,\ t=-1$ ↑

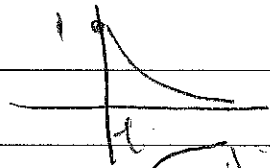
$t+1=2,\ t=1$ Area=2

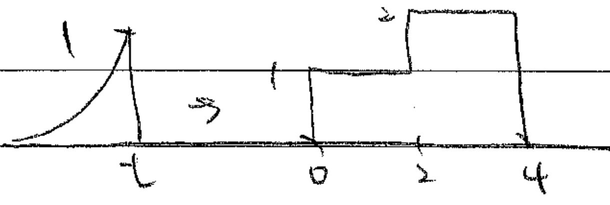
$t+1>2,\ t>1$, Area↑

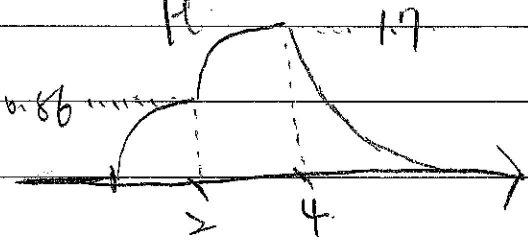
$t+1=4,\ t=3$, Area 4

$t-1>4,\ t=5$, Area=0

又. $y_2 = x(t) * h_2(t)$. 且 $x(t) = e^{-t}u(t)$.







when $t=0$ ↑

$t=2$, Area $= \int_0^2 e^{-t}\,dt \doteq 0.86$

$t=4$, Area $= \int_2^4 2\cdot e^{-t}\,dt = 1.7$

$\int_0^t e^{-t}\,dt = 1-e^{-t},\ t<2$

$\int_0^2 e^{-t}\,dt + \int_2^t e^{-t}\,dt$

$0.86 + e^{-2} - e^{-t},\ 2<t<4$

$\int_2^4 \cancel{e^{-t}} \int_0^2 1\cdot e^{-(t-\tau)}\,d\tau$

$e^{-(t-2)} - e^{-t} + \int_2^t 2\cdot e^{-(t-\tau)}\,d\tau$

$2(e^0 - e^{-(t-2)})$

$e^{-(t-2)} - e^{-t} + 2 - 2e^{-(t-2)}$

$\underline{2 - e^{-t} - e^{-(t-2)}}$ //

$\omega = 2\pi \frac{1}{T}$ $\omega = \frac{2\pi}{T}$

$t = \frac{2\pi}{\omega}$

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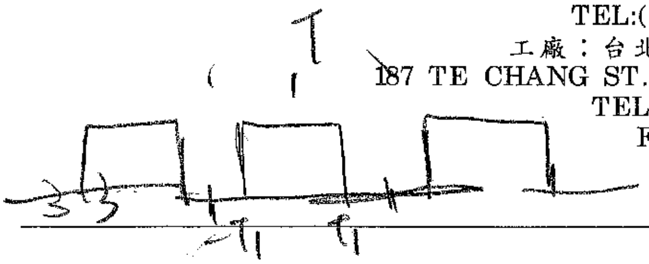


$\frac{1}{1+jk\omega}$

$$X[k] = \frac{1}{\cancel{2\pi}} \int_{-T_1}^{T_1} 1 \cdot e^{-jk\omega t} dt$$

$$= \frac{1}{2\pi} \cdot \frac{1}{-jk\omega} \cdot (e^{-jk\omega T_1} - e^{jk\omega T_1}) = \frac{1}{\cancel{\pi} \cdot jk\omega} (e^{jk\omega T_1} - e^{-jk\omega T_1})$$

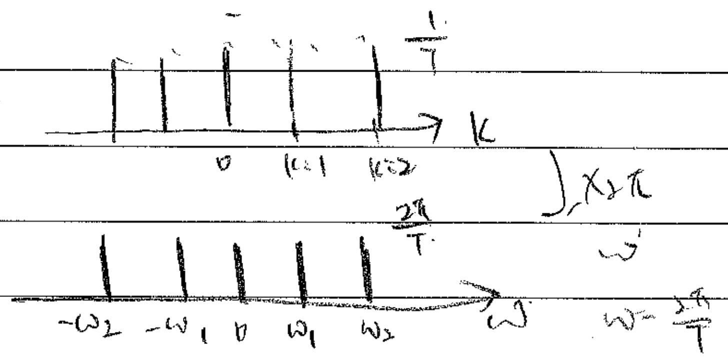
$$\frac{1}{\cancel{\pi} k\omega} \sin(k\omega T_1)$$

$$\frac{1}{T} \int_{-T_1}^{T_1} 1 \, dt \qquad 又 \cdot \omega = \frac{2\pi}{T} \quad \frac{\sin(k \frac{2\pi T_1}{T})}{2\pi k}$$

$\frac{2T_1}{T}$ $2\pi f = \omega$ $\frac{2\pi}{T}$

3-4.

$$\frac{1}{T} \int_0^0 \delta(t) e^{-jk\omega t} dt = \frac{1}{T}, \quad X[k] = \frac{1}{T}$$



$$q(t) = x(t+T_1) - x(t-T_1)$$

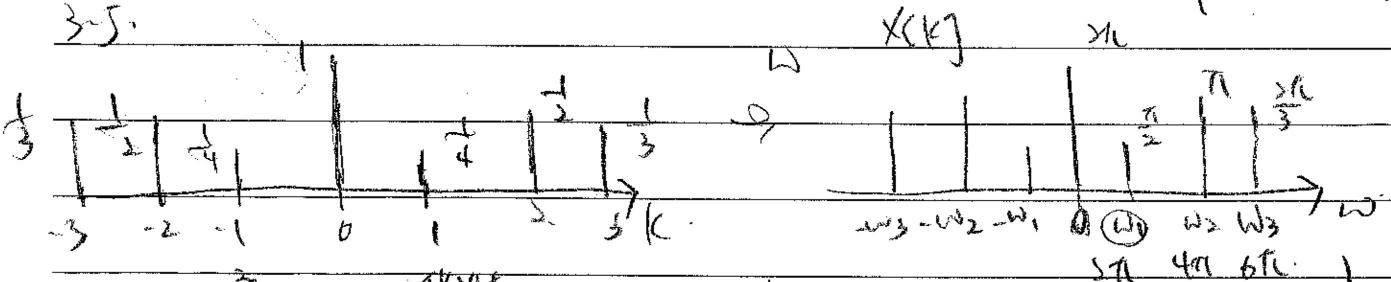
$$Q(j\omega) = X(j\omega) \cdot e^{jk\omega T_1} - X(j\omega) e^{-jk\omega T_1}$$

$$= X(j\omega) [e^{jk\omega T_1} - e^{-jk\omega T_1}]$$

$$= j2X(j\omega) \frac{}{j2} \Rightarrow j2 X(j\omega) \cdot \sin(k\omega T_1) \quad \times \quad \frac{2j2}{T} \sin(k\omega T_1)$$

$$q(t) = \sum_{k=0}^{\infty} Q[k] e^{jk\omega t} \qquad \frac{2j2}{T} \sin\left(\frac{2k\pi T_1}{T}\right)$$

3-5.



$$Y(t) = \sum_{k=-3}^{3} Y[k] \cdot e^{jk\omega t} \qquad 又\ Y(k) = H[k]\, X(k)$$

$\frac{1}{1+2k\omega}$

$$Y(j\omega) = 2\pi X(j\omega) \cdot H(j\pi k)$$

$$\int_0^\infty e^{-t} e^{-jk\omega t} dt$$

$$Y(j\omega) = \frac{2\pi}{1+j2\pi} \cdot \frac{1}{2\pi} \Rightarrow Y[k] =$$

$-t(1+jk\omega)$

$$\frac{1}{1+jk\omega}$$

$V_o(j\omega)\cdot j\omega = \frac{V_i(j\omega)}{\tau} - \frac{V_o(j\omega)}{\tau} \Rightarrow \left(\frac{1}{\tau}+j\omega\right)V_o = \frac{V_i(j\omega)}{\tau}$

$V_o(j\omega) = \frac{V_i(j\omega)}{\tau\times(\frac{1}{\tau}+j\omega)}$ $\quad \frac{1}{a+j\omega} \Rightarrow e^{-at}u(t)$

$\cancel{V_o(t) = \frac{1}{RC} V_i e^{\frac{-t}{\tau}} u(t)}$, $\frac{1}{RC} \cancel{e^{\frac{-t}{\tau}} V_i(t)} \cdot u(t)$

$V_o(t) = V_i(t) * h(t) \quad V_o(j\omega) = V_i(j\omega)\times H(j\omega)$

$\hookrightarrow \frac{1}{\tau(\frac{1}{\tau}+j\omega)} \xrightarrow{I.F.T} \frac{1}{RC}\cdot e^{-\frac{t}{\tau}}u(t) = h(t)$

x^{-1}

$V_o(t) = V_i(t) * h(t)$

$= \int_{-\infty}^{\infty} V_i(\tau)h(t-\tau)\,d\tau \qquad e^{\frac{-t}{RC}+1}$

$\Rightarrow \int_{0}^{\infty} \frac{1}{RC} e^{\frac{-1}{RC}(t-\tau)}\,d\tau = \frac{1}{RC}\, e^{\frac{-1}{RC}(t-\tau)}\Big|_0^{\infty}$

$\int_{-\infty}^{\infty} u(\tau)\cdot\frac{1}{RC}\cdot e^{\frac{-(t-\tau)}{RC}}u(t-\tau)\,d\tau$

$\Rightarrow \int_0^t \frac{1}{RC} e^{\frac{-(t-\tau)}{RC}}\,d\tau$

$\Rightarrow \frac{1}{RC}\left(e^0 - e^{\frac{-t}{RC}}\right) \Rightarrow \frac{1}{RC}\left(1-e^{\frac{-t}{RC}}\right) = V_o(t)$

$\int_{-\infty}^{\infty} x(\tau)u(t-\tau)\,d\tau = x(t)*u(t) \qquad u(t) = \frac{1}{2}\,sgn(j\omega)$

$\frac{d\,sgn(t)}{dt} \Rightarrow 2\delta(t)$ $\qquad X.\ 1 \xrightarrow{F.T} 2\pi\delta(j\omega)$ $\qquad \frac{1}{2} + \frac{1}{2}sgn(t)$

$\downarrow F.T$ $\qquad X(j\omega)\cdot\left(\pi\delta(j\omega) + \frac{1}{j\omega}\right) \to u(t)$

$j\omega\cdot S(j\omega) \Rightarrow 2\cdot 1 \qquad \frac{X(j\omega)}{j\omega} + \pi\delta(j\omega)X(j\omega)$

$S(j\omega) = \frac{2}{j\omega} \qquad \omega = 0$

$\omega = 0 \Rightarrow \int_{-\infty}^{\infty} x(t)e^{-j\omega t}\big|_{\omega=0}\,dt$