Ornelas García Luis Angel
3CV6

Problemario 1er parcial

1) $F(t) = e^{-t}$ $\quad T = 1 \quad \omega_0 = 2\pi$

$a_n = \frac{2}{T}\int f(t)\cos(n\omega_0 t) = 2\int_0^1 e^{-t}\cos(2n\pi t)$

$\int e^{-t}\cos(2\pi n t) = Y = \frac{e^{-t}}{2\pi n}\text{sen}(2\pi n t) + \frac{1}{2\pi n}\int e^{-t}\text{sen}(2\pi n t)$

$\boxed{u = e^{-t} \quad dv = \cos(2\pi n t) \quad du = -e^{-t} \quad v = \frac{\text{sen}(2\pi n t)}{2\pi n}}$ $\quad \boxed{u = e^{-t} \quad dv = \text{sen}\, 2\pi n t \quad du = -e^{-t} \quad v = \frac{-\cos(2\pi n t)}{2\pi n}}$

$Y = \frac{e^{-t}}{2\pi n}\text{sen}(2n\pi t) + \frac{1}{2\pi n}\left[\frac{-e^{-t}}{2\pi n}\cos(2\pi n t) - \frac{1}{2\pi n} Y\right] = \frac{e^{-t}}{2\pi n}\text{sen}(2\pi n t) + \frac{-e^{-t}}{4\pi^2 n^2}\cos(2n\pi t) - \frac{Y}{4\pi^2 n^2}$

$Y\left(1 + \frac{1}{4\pi^2 n^2}\right) = \frac{e^{-t}}{2\pi n}\text{sen}(2n\pi t) - \frac{e^{-t}}{4\pi^2 n^2}\cos(2\pi n t)$

$Y = \left(\frac{4\pi^2 n^2}{1 + 4\pi^2 n^2}\right)\left(\frac{e^{-t}}{2\pi n}\text{sen}(2\pi n t) - \frac{e^{-t}}{4\pi^2 n^2}\cos(2\pi n t)\right) = \left(\frac{2\pi n}{1 + 4\pi^2 n^2}\right)\left(e^{-t}\text{sen}(2\pi n t) - \frac{e^{-t}}{2\pi n}\cos(2\pi n t)\right)$

$a_n = \left(\frac{4\pi n}{1 + 4\pi^2 n^2}\right)\left(\frac{\text{sen}(2\pi n t)}{e^t} - \frac{\cos(2\pi n t)}{2\pi n e^t}\right)\Big|_0^1 = \left(\frac{4\pi n}{1 + 4\pi^2 n^2}\right)\left(\frac{\cancel{\text{sen}(2\pi n)}^{0}}{e} - \frac{\cancel{\cos(2\pi n)}^{1}}{2\pi n e} - \emptyset + \frac{1}{2\pi n}\right)$

$= \left(\frac{4\pi n}{1 + 4\pi^2 n^2}\right)\left(\frac{1}{2\pi n}(-e^{-1} + 1)\right) = \left(\frac{2}{1 + 4\pi^2 n^2}\right)(1 - e^{-1}) = \frac{2 - 2e^{-1}}{1 + 4\pi^2 n^2}$

$a_0 = \frac{1}{T}\int F(t) = \int_0^1 e^{-t} = -e^{-t}\Big|_0^1 = -e^{-1} + 1$

$b_n = \frac{2}{T}\int F(t)\,\text{sen}(n\omega_0 t) = 2\int_0^1 e^{-t}\text{sen}(2n\pi t)$

$X = \int e^{-t}\text{sen}(2n\pi t) = \frac{-e^{-t}\cos(2n\pi t)}{2n\pi} - \frac{1}{2n\pi}\int e^{-t}\cos(2\pi n t) = \frac{-\cos(2\pi n t)}{2n\pi e^t} - \frac{1}{2\pi n}\left[\frac{e^{-t}\text{sen}(2\pi n t)}{2\pi n} + \frac{X}{2n\pi}\right]$

$\boxed{u = e^{-t} \quad dv = \text{sen}(2n\pi t) \quad du = -e^{-t} \quad v = \frac{-\cos(2n\pi t)}{2n\pi}}$ $\quad \boxed{u = e^{-t} \quad dv = \cos(2\pi n t) \quad du = -e^{-t} \quad v = \frac{\text{sen}(2\pi n t)}{2\pi n}}$

$X\left(1 + \frac{1}{(2\pi n)^2}\right) = \frac{-\cos(2\pi n t)}{2\pi n e^t} - \frac{\text{sen}(2\pi n t)}{(2\pi n)^2 e^t}$

$X = \left(\frac{-(2\pi n)^2}{1 + (2\pi n)^2}\right)\left(\frac{\cos(2\pi n t)}{2\pi n e^t} + \frac{\text{sen}(2\pi n t)}{(2\pi n)^2 e^t}\right) = \left(\frac{-2\pi n}{1 + (2\pi n)^2}\right)\left(\frac{\cos(2\pi n t)}{e^t} + \frac{\text{sen}(2\pi n t)}{2\pi n e^t}\right)$

$b_n = \left(\frac{-4\pi n}{1 + (2\pi n)^2}\right)\left(\frac{\cancel{\cos(2\pi n)}^{1}}{e} + \frac{\cancel{\text{sen}(2\pi n)}^{0}}{2\pi n e} - 1 - \emptyset\right) = \left(\frac{-4\pi n}{1 + (2\pi n)^2}\right)(e^{-1} - 1)$

Ornelas García Luis Angel
3CV6

$F(t) = t^2 \qquad T = 1 \qquad \omega_0 = 2\pi$

$$a_n = 2\int_0^1 t^2 \cos(2\pi n t) = 2\left[\frac{t^2 \operatorname{sen}(2\pi n t)}{2\pi n} - \frac{2}{2\pi n}\int t \operatorname{sen}(2\pi n t)\right]$$

$$\boxed{\begin{array}{ll} u = t^2 & dv = \cos(2\pi n t) \\ du = 2t & v = \dfrac{\operatorname{sen}(2\pi n t)}{2\pi n} \end{array}} \qquad \boxed{\begin{array}{ll} u = t & dv = \operatorname{sen}(2\pi n t) \\ du = dt & v = \dfrac{-\cos(2\pi n t)}{2\pi n} \end{array}}$$

$$= \frac{t^2 \operatorname{sen}(2\pi n t)}{\pi n} + \frac{-2}{n\pi}\left[\frac{-t\cos(2\pi n t)}{2\pi n} + \frac{1}{2\pi n}\int \cos(2\pi n t)\right]$$

$$= \frac{t^2 \operatorname{sen}(2\pi n t)}{\pi n} + \frac{-1}{n\pi}\left[\frac{-t\cos(2\pi n t)}{\pi n} + \frac{1}{2\pi^2 n^2}\operatorname{sen}(2\pi n t)\right]\Bigg|_0^1$$

$$= \cancel{\frac{\operatorname{sen}(2\pi n)}{\pi n}}^{\,0} + \frac{-1}{n\pi}\left[\frac{-\cos(2\pi n)^{\,1}}{\pi n} + \cancel{\frac{\operatorname{sen}(2\pi n)}{2\pi^2 n^2}}^{\,0}\right] - 0 - \frac{1}{n\pi}\left[\cancel{\frac{0}{n\pi}}^{\,0} + 0\right] = \frac{1}{(n\pi)^2}$$

$$a_0 = \int_0^1 t^2 = \frac{t^3}{3}\Big|_0^1 = \frac{(1-0)}{3} = \frac{1}{3}$$

$$b_n = 2\int_0^1 t^2 \operatorname{sen}(2n\pi t) = 2\left[\frac{-t^2\cos(2\pi n t)}{2\pi n} + \frac{2}{2\pi n}\int t\cos(2\pi n t)\right]$$

$$\boxed{\begin{array}{ll} u = t^2 & dv = \operatorname{sen}(2\pi n t) \\ du = 2t & v = \dfrac{-\cos(2\pi n t)}{2\pi n} \end{array}} \qquad \boxed{\begin{array}{ll} u = t & dv = \cos(2\pi n t) \\ du = dt & v = \dfrac{\operatorname{sen}(2\pi n t)}{2\pi n} \end{array}}$$

$$= \frac{-t^2\cos(2\pi n t)}{\pi n} + \frac{2}{\pi n}\left[\frac{t\operatorname{sen}(2\pi n t)}{2\pi n} + \frac{1}{2\pi n}\int \operatorname{sen}(2\pi n t)\right]$$

$$= \frac{-t^2\cos(2n\pi t)}{\pi n} + \frac{1}{n\pi}\left[\frac{t\operatorname{sen}(2\pi n t)}{\pi n} + \frac{-1}{(n\pi)^2}\cos(2\pi n t)\right]\Bigg|_0^1$$

$$= \frac{-\cos(2\pi n)^{\,1}}{\pi n} + \frac{1}{n\pi}\left[\cancel{\frac{\operatorname{sen}(2\pi n t)}{\pi n}}^{\,0} - \frac{\cos(2\pi n)^{\,1}}{(n\pi)^2}\right] + 0 - \frac{1}{n\pi}\left[0 - \frac{1}{(n\pi)^2}\cos(0)^{\,+1}\right]$$

$$= \frac{-1}{\pi n} - \cancel{\frac{1}{(n\pi)^3}} + \cancel{\frac{1}{(n\pi)^3}} = -\frac{1}{n\pi}$$

$$f(t) = \frac{1}{3} + \sum_{n=1}^{\infty}\left[\left(\frac{1}{(n\pi)^2}\right)\left(\cos(2\pi n t)\right) + \left(-\frac{1}{n\pi}\right)\left(\operatorname{sen}(2\pi n t)\right)\right]$$

Ornelas García Luis Angel
3CV6

$f(t) = 2t \qquad T = 1 \qquad w_0 = 2\pi$

$$a_n = \frac{2}{T}\int f(t)\cos(nw_0 t) = 2\int_0^1 2t\cos(2\pi n t) = 4\left[\frac{t\,sen(2\pi n t)}{2\pi n} + \frac{-1}{2\pi n}\int sen(2\pi n t)\right]$$

$$\boxed{\begin{matrix} u = t & dv = \cos(2\pi n t) \\ du = dt & v = \frac{sen(2\pi n t)}{2\pi n} \end{matrix}}$$

$$= 2\left[\frac{t\cdot sen(2\pi n t)}{\pi n} + \frac{1}{2\pi^2 n^2}\cos(2\pi n t)\right]\Bigg|_0^1 = 2\left[\frac{sen(2\pi n)}{\pi n} + \frac{\cos(2\pi n)}{2\pi^2 n^2} - 0 - \frac{\cos(0)}{2\pi^2 n^2}\right] = 0$$

$$a_0 = \frac{1}{T}\int f(t) = \int_0^1 2t = t^2\Big|_0^1 = 1 - 0 = 1$$

$$b_n = \frac{2}{T}\int f(t)\, sen(nw_0 t) = 2\int_0^1 2t\, sen(2\pi n t) = 4\left[\frac{-t\cos(2\pi n t)}{2\pi n} + \frac{1}{2\pi n}\int \cos(2\pi n t)\right]$$

$$\boxed{\begin{matrix} u = t & dv = sen(2\pi n t) \\ du = dt & v = \frac{-\cos(2\pi n t)}{2\pi n} \end{matrix}}$$

$$= 2\left[\frac{-t\cos(2\pi n t)}{\pi n} + \frac{1}{2\pi^2 n^2} sen(2\pi n t)\right]\Bigg|_0^1 = 2\left[\frac{-\cos(2\pi n t)}{\pi n} + \frac{sen(2\pi n)}{2\pi^2 n^2} + 0 - \frac{sen\, 0}{2\pi^2 n^2}\right]$$

$$= \frac{-2}{\pi n}$$

$$f(t) = 1 + \sum_{n=1}^{\infty}\left(-\frac{2}{\pi n}\right) sen(2\pi n t)$$

Ornelas García Luis Angel
3CV6

2. 

$T = 2\pi \qquad \omega_0 = 1 \qquad b_n = 0$

$$F(t) = \begin{cases} A\cos t & 0 < t < \pi/2 \\ 0 & \pi/2 < t < \pi \end{cases}$$

$$a_n = \frac{4}{T}\int F(t)\cos(n\omega_0 t) = \frac{4A}{2\pi}\int_0^{\pi/2}\cos t\,\cos(nt) = \frac{2A}{\pi}\int_0^{\pi/2}\left[\frac{1}{2}\left(\cos[(1+n)t] + \cos[(1-n)t]\right)\right]$$

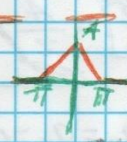
$$= \frac{A}{\pi}\left[\frac{\operatorname{sen}[(1+n)t]}{1+n} + \frac{\operatorname{sen}[(1-n)t]}{1-n}\right]\Bigg|_0^{\pi/2} = \frac{A}{\pi}\left[\frac{\operatorname{sen}[(1+n)\pi/2]}{1+n} + \frac{\operatorname{sen}[(1-n)\pi/2]}{1-n} + 0\right]$$

$$= \frac{A}{\pi}\left[\frac{\operatorname{sen}[(1+n)\pi/2]}{1+n} + \frac{\operatorname{sen}[(1-n)\pi/2]}{1-n}\right]$$

$$a_0 = \frac{2}{T}\int F(t) = \frac{1}{\pi}\int_0^{\pi/2} A\cos t = \frac{A}{\pi}\int_0^{\pi/2}\cos t = \frac{A}{\pi}\left[\operatorname{sen} t\right]\Big|_0^{\pi/2} = \frac{A}{\pi}(\overset{1}{\operatorname{sen}\pi/2} - \operatorname{sen} 0) = \frac{A}{\pi}$$

$$a_1 = \frac{4A}{2\pi}\int_0^{\pi/2}\frac{1}{2}\left[\cos(1+1)t + \cos(1-1)t\right] = \frac{A}{\pi}\int_0^{\pi/2}\left[\cos 2t + \overset{1}{\cos 0}\right] = \frac{A}{2\pi}\int_0^{\pi/2}\left[\cos 2t + 1\right]$$

$$= \frac{A}{\pi}\left[\frac{\operatorname{sen}(2t)}{2} + t\right]\Bigg|_0^{\pi/2} = \frac{A}{\pi}\left[\overset{0}{\cancel{\frac{\operatorname{sen}(2\pi/2)}{2}}} + \frac{\pi}{2} - \overset{0}{\cancel{\frac{\operatorname{sen} 0}{2}}} - \overset{0}{0}\right] = \frac{A}{2}$$



$F(t) = A(-t+1) \quad 0 < t < \pi \qquad b_n = 0$

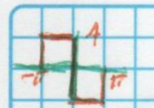
$$a_0 = \frac{2}{T}\int F(t) = \frac{A}{\pi}\int_0^{\pi}(-t+1) = \frac{A}{\pi}\left[\frac{-t^2}{2} + t\right]\Bigg|_0^{\pi} = \frac{A}{\pi}\left[\frac{-\pi^2}{2} + \pi - 0 + 0\right] = \frac{-A\pi}{2} + A\pi$$

$$a_n = \frac{-4A}{2\pi}\int(t-1)\cos(nt) = \frac{-2A}{\pi}\left[\int t\cos nt - \int\cos nt\right] = \frac{-2A}{\pi}\left[\frac{t\operatorname{sen}(nt)}{n} - \frac{1}{n}\int\operatorname{sen} nt - \frac{1}{n}\operatorname{sen}(nt)\right]$$

$$= \frac{-2A}{n\pi}\left[t\operatorname{sen}(nt) + \frac{\cos(nt)}{n} - \operatorname{sen}(nt)\right]\Bigg|_0^{\pi} = \frac{-2A}{n\pi}\left[\pi\overset{0}{\cancel{\operatorname{sen}(n\pi)}} + \frac{\cos(n\pi)}{n} - \overset{0}{\cancel{\operatorname{sen}(n\pi)}} - 0 - \frac{1}{n} + 0\right]$$

$$= \frac{-2A}{n^2\pi}\left[(-1)^n - 1\right]$$

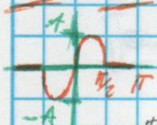
Ornelas García Luis Angel
3CV6



$f(t) = A \quad 0<t<\pi \quad T = 2\pi \quad \omega_0 = 1 \quad a_n = a_0 = 0$

$b_n = \frac{4}{T}\int f(t)\,sen(n\omega_0 t) = \frac{4A}{2\pi}\int_0^{\pi} sen(nt) = -\frac{2A}{\pi}\frac{1}{n}\cos(nt)\Big|_0^{\pi}$

$= -\frac{2A}{n\pi}\left[\cos(\pi n) - \cos(\cancel{0})^{1}\right] = -\frac{2A}{n\pi}\left[(-1)^n - 1\right]$



$f(t) = \begin{cases} A\,sen\,2t & 0<t<\pi/2 \\ 0 & \pi/2<t<\pi \end{cases} \qquad a_n = a_0 = 0$

$b_n = \frac{4A}{2\pi}\int_0^{\pi/2} sen(2t)\,sen(nt) = \frac{2A}{\pi}\int_0^{\pi/2}\frac{1}{2}\left[\cos(2t-nt) - \cos(2t+nt)\right] = \frac{A}{\pi}\int_0^{\pi/2}\left[\cos(2-n)t - \cos(2+n)t\right]$

$= \frac{A}{\pi}\left[\frac{sen(2-n)t}{2-n} - \frac{sen(2+n)t}{2+n}\right]\Big|_0^{\pi/2} = \frac{A}{\pi}\left[\frac{sen\left(\frac{2\pi-n\pi}{2}\right)}{2-n} - \frac{sen\left(\frac{2\pi+n\pi}{2}\right)}{2+n} - \cancel{\frac{sen\,0}{2-n}}^{0} + \cancel{\frac{sen\,0}{2+n}}^{0}\right]$

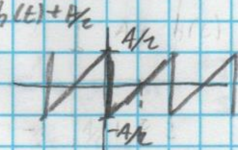
$= \frac{A}{\pi}\left[\frac{sen\left(\frac{2\pi-n\pi}{2}\right)}{2-n} - \frac{sen\left(\frac{2\pi+n\pi}{2}\right)}{2+n}\right]$

$b_1 = \frac{A}{\pi}\left[\frac{sen\left(\frac{2\pi-\pi}{2}\right)}{2-1} - \frac{sen\left(\frac{2\pi+\pi}{2}\right)}{2+1}\right] = \frac{A}{\pi}\left[\frac{\cancel{sen(\pi/2)}^{1}}{1} - \frac{\cancel{sen(3\pi/2)}^{-1}}{3}\right] = \frac{A}{\pi}\left[1 + 1/3\right] = \frac{4A}{3\pi}$

$b_2 = \frac{A}{\pi}\int_0^{\pi/2}\left[\cancel{\cos 0}^{1} - \cos 4t\right] = \frac{A}{\pi}\left[t - \frac{sen\,4t}{4}\right]\Big|_0^{\pi/2} = \frac{A}{\pi}\left[\pi/2 - \cancel{\frac{sen(4\pi/2)}{4}}^{0} - 0 + \cancel{\frac{sen\,0}{4}}^{0}\right] = \frac{A}{2}$

3

$F(t) = h(t) + A/2$



$h(t) = \frac{A}{2}(t-1) \quad 0\le t\le 2 \qquad a_0 = a_n = 0$

Impar

$T = 2 \quad \omega_0 = \frac{2\pi}{2} = \pi$

$b_n = \frac{4}{T}\int h(t)\,sen(n\omega_0 t)\,dt = \frac{4}{2}\int_0^1 \frac{A}{2}(t-1)\,sen(n\pi t)\,dt = A\int_0^1 (t-1)\,sen(n\pi t)\,dt$

$u = t \quad dv = sen(n\pi t)$
$du = dt \quad v = \frac{-1}{n\pi}\cos(n\pi t)$

$= A\left[\frac{-t}{n\pi}\cos(n\pi t) - \frac{-1}{n\pi}\int \cos(n\pi t)\,dt + (-1)\frac{-1}{n\pi}\cos(n\pi t)\right]$

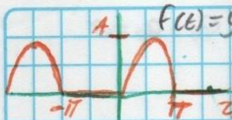
$= \frac{-A}{n\pi}\left[\cos(n\pi t)(t-1) - \frac{1}{n\pi}sen(n\pi t)\right]\Big|_0^1$

$= \frac{-A}{n\pi}\left[\cancel{\cos(n\pi)(1-1)}^{0} - \cancel{\frac{1}{n\pi}sen(n\pi)}^{0} - \cancel{\cos(0)}^{1}(-1) + \cancel{\frac{1}{n\pi}sen(0)}^{0}\right] = \frac{-A}{n\pi}$

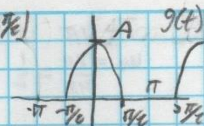
$h(t) = \sum_{n=1}^{\infty}\left(\frac{-A}{n\pi}\right) sen(n\pi t)$

$F(t) = 1 + \sum_{n=1}^{\infty}\left(\frac{-A}{n\pi}\right) sen(n\pi t)$

Ornelas García Luis Angel
3CV6



$f(t) = g(t - \pi/2)$



$g(t) = A\cos(t)$ $\quad b_n = \emptyset$

$T = 2\pi \quad w_0 = 1$

$$a_n = \frac{4}{T}\int g(t)\cos(nw_0t) = \frac{4A}{2\pi}\int_0^{\pi/2}\cos(t)\cos(nt) = \frac{\cancel{4}A}{\cancel{2}\pi}\,\frac{1}{2}\int_0^{\pi/2}\left[\cos(n+1)t + \cos(n-1)t\right]$$

$$= \frac{A}{\pi}\left[\frac{1}{n+1}\operatorname{sen}(n+1)t + \frac{1}{n-1}\operatorname{sen}(n-1)t\right]\Big|_0^{\pi/2} = \frac{A}{\pi}\left[\frac{1}{n+1}\left(\operatorname{sen}(n+1)\pi/2 - \cancel{\operatorname{sen}0}\right) + \frac{1}{n-1}\left(\operatorname{sen}(n-1)\pi/2 - \cancel{\operatorname{sen}0}\right)\right]$$

$$= \frac{A}{\pi}\left[\frac{1}{n+1}\operatorname{sen}((n+1)\pi/2) + \frac{1}{n-1}\operatorname{sen}((n-1)\pi/2)\right]$$

$$a_0 = \frac{2}{T}\int g(t)\,dt = \frac{\cancel{2}}{\cancel{2}\pi}\int_0^{\pi/2}A\cos(t)\,dt = \frac{A}{\pi}\operatorname{sen}(t)\Big|_0^{\pi/2} = \frac{A}{\pi}\left(\overset{1}{\cancel{\operatorname{sen}\pi/2}} - \overset{0}{\cancel{\operatorname{sen}0}}\right) = A/\pi$$

$$a_1 = \frac{4A}{2\pi}\int_0^{\pi/2}\cos(t)\cos(t) = \frac{2A}{\pi}\int\cos^2 t = \frac{A}{\pi}\int_0^{\pi/2}(1+\cos 2x) = \frac{A}{\pi}\left(t + \frac{1}{2}\operatorname{sen}2x\right)\Big|_0^{\pi/2}$$

$$= \frac{A}{\pi}\left((\pi/2 - 0) + \frac{1}{2}\left(\cancel{\operatorname{sen}\pi} - \cancel{\operatorname{sen}0}\right)\right) = \frac{A\pi}{2\pi} = \frac{A}{2}$$

$$g(t) = \frac{A}{\pi} + \frac{A}{\pi}\cos(t) + \frac{A}{\pi}\sum_{n=2}^{\infty}\left(\frac{1}{n-1}\operatorname{sen}((n+1)\pi/2) + \frac{1}{n-1}\operatorname{sen}((n-1)\pi/2)\right)\cos(nt)$$

$f(t) = g(t - \pi/2)$

$$f(t) = \begin{cases} 0 & -2 < t < -1 \\ 2A(t+1) & -1 < t < -1/2 \\ A & -1/2 < t < 1/2 \\ -2A(t-1) & 1/2 < t < 1 \\ 0 & 1 < t < 2 \end{cases}$$

Par $\therefore b_n = \emptyset$

$T = 4$

$w_0 = \frac{2\pi}{4} = \pi/2$

$$a_n = \frac{4}{T}\int f(t)\operatorname{sen}(nw_0t) = \int_0^{1/2}A\operatorname{sen}(nw_0t) + \int_{1/2}^{1}-2A(t-1)\operatorname{sen}(nw_0t)$$

$$= \frac{-A}{nw_0}\cos(nw_0t)\Big|_0^{1/2} - 2A\left[\int_{1/2}^{1}t\operatorname{sen}(nw_0t) - \int_{1/2}^{1}\operatorname{sen}(nw_0t)\right]$$

$u = t \quad dv = \operatorname{sen}(nw_0t)$

$du = dt \quad v = \frac{-1}{nw_0}\cos(nw_0t)$

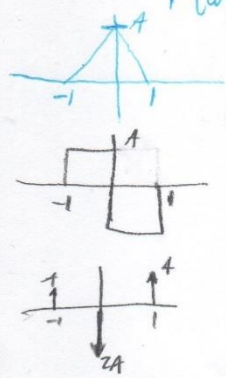
$$= \frac{-A}{nw_0}\cos(nw_0t)\Big|_0^{1/2} - 2A\left[\frac{-t}{nw_0}\cos(nw_0t) - \frac{-1}{nw_0}\int\cos(nw_0t) - \frac{-1}{nw_0}\cos(nw_0t)\right]$$

$$= \frac{-A}{nw_0}\cos(nw_0t)\Big|_0^{1/2} + \frac{2A}{nw_0}\left[-t\cos(nw_0t) - \frac{1}{nw_0}\operatorname{sen}(nw_0t) - \cos(nw_0t)\right]\Big|_{1/2}^{1}$$

$$= \frac{-2A}{n\pi}\left(\cos\left(\frac{n\pi}{4}\right) - \cos(0)\right) + \frac{4A}{n\pi}\left[-\cos\left(\frac{n\pi}{2}\right) - \frac{2}{n\pi}\operatorname{sen}\left(\frac{n\pi}{2}\right) - \cos\left(\frac{n\pi}{2}\right) + \frac{1}{2}\cos\left(\frac{n\pi}{4}\right) + \frac{2}{n\pi}\operatorname{sen}\left(\frac{n\pi}{4}\right) + \cos\left(\frac{n\pi}{4}\right)\right]$$

$$= \frac{-2A}{n\pi}\left(\cos\left(\frac{n\pi}{4}\right) - 1\right) + \frac{4A}{n\pi}\left[-2\cos\left(\frac{n\pi}{2}\right)\right.$$

Ornelas García Luis Angel
3CV6



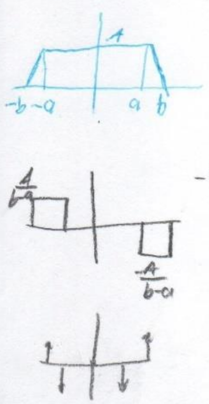
$$F(w) = \begin{cases} A(w-1) & -1 < w < 0 \\ -A(w+1) & 0 < w < 1 \end{cases}$$

$$F = A\delta(w-1) - 2A\delta(w) + A\delta(w+1)$$

$$f = \frac{A}{2\pi}\left(e^{it} + e^{-it}\right) - \frac{A}{\pi}$$

$$= \frac{-A}{\pi w^2}(\cos t - 1)$$

$\delta(t) \leftrightarrow 1$	$\delta(t) \leftrightarrow 1$	$\delta(t) \leftrightarrow 1$
$\frac{1}{2\pi} \leftrightarrow \delta(w)$	$\frac{1}{2\pi} \leftrightarrow \delta(w)$	$\frac{1}{2\pi} \leftrightarrow \delta(w)$
$\frac{A}{2\pi} e^{it} \leftrightarrow A\delta(w-1)$	$\frac{A}{2\pi} e^{-it} \leftrightarrow A\delta(w+1)$	$-\frac{2A}{2\pi} \leftrightarrow -2A\delta(w)$



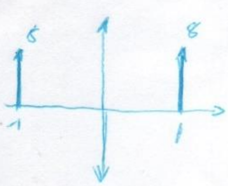
$$F(w) = \begin{cases} \frac{A}{b-a}(w+b) & -b < w < -a \\ A & -a < w < a \\ \frac{-A}{b-a}(w-b) & a < w < b \end{cases}$$

$$-w^2 F = \frac{A}{b-a}\delta(w-b) - \frac{A}{b-a}\delta(w-a) - \frac{A}{b-a}\delta(w+a) + \frac{A}{b-a}\delta(w+b)$$

$$= \frac{A}{b-a}\cdot\frac{1}{2\pi}\left(e^{ibt} - e^{iat} - e^{-iat} + e^{-ibt}\right)$$

$$= \frac{A}{\pi(b-a)}\left(\cos(bt) - \cos(at)\right)$$

$$F = \frac{-A}{\pi(b-a)w^2}\left(\cos(bt) - \cos(at)\right)$$



$$F(w) = 8\delta(w-1) + 8\delta(w+1)$$

$$f = 8\left(e^{it} + e^{-it}\right) = 16\cos(t)$$

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3CV6

8) $F(2-t) \leftrightarrow ?$

$F(t+2) \longleftrightarrow F(w)\,e^{+2iw}$

$F(-t+2) \longleftrightarrow F(-w)\,e^{2iw}$

$F(t-6) \longrightarrow ?$

$F(t) \longleftrightarrow F(w)$

$F(t-6) \longrightarrow F(w)\,e^{-i6w}$

$F'(t)\operatorname{sen} t \longleftrightarrow ?$

$F(t) \longleftrightarrow F(w)$

$F'(t) \longrightarrow iw\,F(w)$

$F'(t)\operatorname{sen} t \longleftrightarrow \frac{w}{2}\left[F(w+1) - F(w-1)\right]$

$F'(-2t) \longrightarrow ?$

$F(t) \longrightarrow F(w)$

$F(-2t) \longrightarrow \frac{1}{2} F(w/2)$

$F'(-2t) \longrightarrow \frac{iw}{2} F(w/2)$

$t\,F(3t) \longleftrightarrow ?$

$F(t) \longleftrightarrow F(w)$

$F(3t) \longleftrightarrow \frac{F(w/3)}{3}$

$t\,F(3t) \longleftrightarrow \frac{F'(w/3)}{3i}$

$(t-5)\,F(t) \longleftrightarrow ?$

$F(t) \longleftrightarrow F(w)$

$F(t+5) \longleftrightarrow F(w)\,e^{5iw}$

$-it\,F(t+5) \longleftrightarrow \frac{d}{dw}\left(F(w)\,e^{5iw}\right)$

$(t-5)\,F(t) \longleftrightarrow \frac{d}{dw}\left(F(w)\,e^{5iw}\right)e^{-5iw} \cdot i$

$t\,F'(t) \longrightarrow ?$

$F(t) \longleftrightarrow F(w)$

$F'(t) \longrightarrow jw\,F(w)$

$t\,F'(t) \longleftrightarrow \frac{d}{dw}\left[w\,F(w)\right]$

$F(6-t) \longrightarrow ?$

$F(t) \longrightarrow F(w)$

$F(t+6) \longrightarrow F(w)\,e^{6iw}$

$F(-t+6) \longleftrightarrow F(-w)\,e^{-6iw}$

$F(8-t)\cdot(2-t) \longrightarrow ?$

9) $5\delta(t-1)$

$\delta(t) — 1$

$\delta(t-1) — e^{-iw}$

$5\delta(t-1) — 5e^{-iw}$

$8\delta(w+1) + 8\delta(w-1)$

$\delta(t) — 1$

$\frac{1}{2\pi} — \delta(w)$

$\frac{e^{-it}}{2\pi} — \delta(w+1)$

$\frac{4e^{-it}}{\pi} — 8\delta(w+1)$

$\frac{4}{\pi}\left(e^{-it} + e^{it}\right) — 8\delta(w+1) + 8\delta(w-1)$

$\frac{8}{\pi}\cos(t) — 8\delta(w+1) + 8\delta(w-1)$

t

$\delta(t) — 1$

$1 — 2\pi\delta(w)$

$t — -2i\pi\delta'(w)$

t^2

$1 — 2\pi\delta(w)$

$t^2 — 2\pi\delta''(w)$

$2C_2(t)\cos 1000t$

$AC_d(t) — Ad\,S_a\left(\frac{wd}{2}\right)$

$2C_2(t) — 4\,S_a(w)$

$2C_2(t)\cos(1000t) — 2\left(S_a(w+1000) + S_a(w-1000)\right)$

$\cos(1000w)$

$\delta(t) — 1$

$1 — 2\pi\delta(w)$

$\cos(1000t) — 2\pi\left(\delta(w+1000) + \delta(w-1000)\right)$

$\delta(t+1000) + \delta(t-1000) — 4\pi\cos(1000w)$

$\frac{1}{4\pi}\left(\delta(t+1000) + \delta(t-1000)\right) — \cos(1000w)$

$5w$

$\delta(t) — 1$

$\delta'(t) — iw$

$-i\delta'(t) — w$

$-5i\delta'(t) — 5w$

$\delta(w)\,e^{-i5w}$

$\delta(t) — 1$

$\frac{1}{2\pi} — \delta(w)$