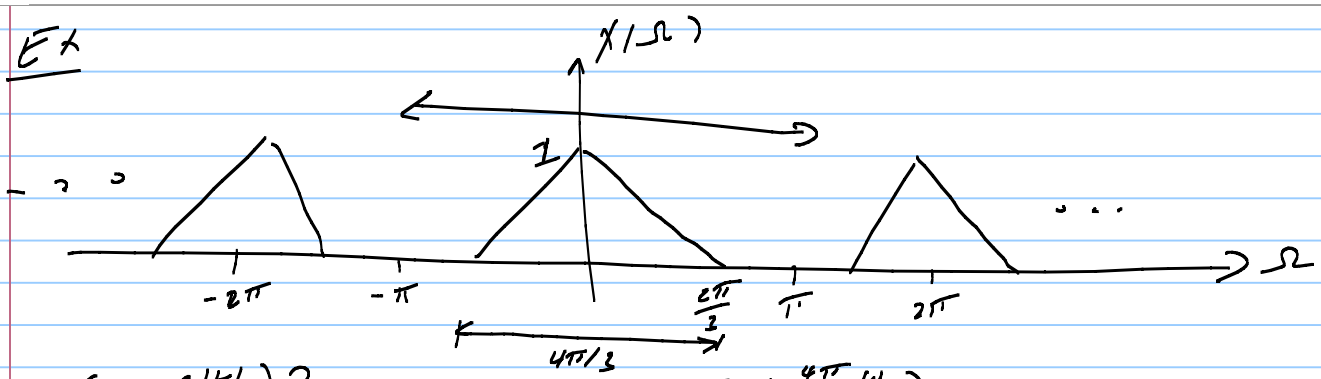
Note Title 3/26/2019

Ex



$$\left(1-\frac{2|t|}{\frac{4\pi}{3}}\right)P_{\frac{4\pi}{3}}(t) \longleftrightarrow \frac{4\pi/3}{2}\,\text{sinc}^2\left(\frac{\frac{4\pi}{3}\omega}{4\pi}\right)$$

$$\left(1-\frac{3|t|}{2\pi}\right)P_{\frac{4\pi}{3}}(t) \longleftrightarrow \frac{2\pi}{3}\,\text{sinc}^2\left(\frac{\omega}{3}\right)$$

$$\frac{2\pi}{3}\,\text{sinc}^2\left(\frac{t}{3}\right) \longleftrightarrow 2\pi\left(1-\frac{3|\omega|}{2\pi}\right)P_{\frac{4\pi}{3}}(\omega)$$

$$\frac{1}{3}\,\text{sinc}^2\left(\frac{t}{3}\right) \longleftrightarrow \left(1-\frac{3|\omega|}{2\pi}\right)P_{\frac{4\pi}{3}}(\omega)$$

OR for $\langle\Omega\rangle_{2\pi}$, $0 \le \Omega \le 2\pi$; $-\pi \le \Omega \le \pi$

$$\frac{1}{3}\,\text{sinc}^2\left(\frac{n}{3}\right) \longleftrightarrow \left(1-\frac{3|\Omega|}{2\pi}\right)P_{\frac{4\pi}{3}}(\Omega)$$

OR

$$\frac{1}{3}\,\text{sinc}^2\left(\frac{n}{3}\right) \longleftrightarrow \sum_{k=-\infty}^{\infty}\left(1-\frac{3|\Omega+2\pi k|}{2\pi}\right)P_{\frac{4\pi}{3}}(\Omega+2\pi k)$$

$$X_k = \sum_{n=0}^{N-1} x[n]e^{-j\frac{2\pi kn}{N}} \qquad k = 0,1,2,\ldots,N-1$$

$x[-2] = 2$; $x[-1] = 2$; $x[0] = 2$; $x[1] = 2$;

$$X_k = \sum_{n=0}^{3} x[n]e^{-\frac{j2\pi kn}{4}}$$

$$X_k = 2e^{0} + 2e^{-j\frac{k\pi}{2}} + 2e^{-jk\pi} + 2e^{-j\frac{3k\pi}{2}}$$

$n=0$ $\quad$ $n=1$ $\quad$ $n=2$ $\quad$ $n=3$

$$X_0 = 2e^{0} + 2e^{0} + 2e^{0} + 2e^{0} = 8$$

$$X_1 = 2e^{0} + 2e^{-j\frac{\pi}{2}} + 2e^{-j\pi} + 2e^{-j\frac{3\pi}{2}} = 0$$

$-j$ $\quad$ -1 $\quad$ j

$$X_2 = 2e^{0} + 2e^{-j\pi} + 2e^{-j2\pi} + 2e^{-j3\pi} = 0$$

-1 $\quad$ 1 $\quad$ -1

$$X_3 = 2e^{0} + 2e^{-j\frac{3}{2}\pi} + 2e^{-j3\pi} + 2e^{-j\frac{9\pi}{2}} = 0$$

j $\quad$ -1 $\quad$ $-j$

$$x[n] = \frac{1}{N}\sum_{n=0}^{N-1} X_k e^{j\frac{2\pi kn}{N}} \qquad n = 0,1,2,\ldots,N-1$$