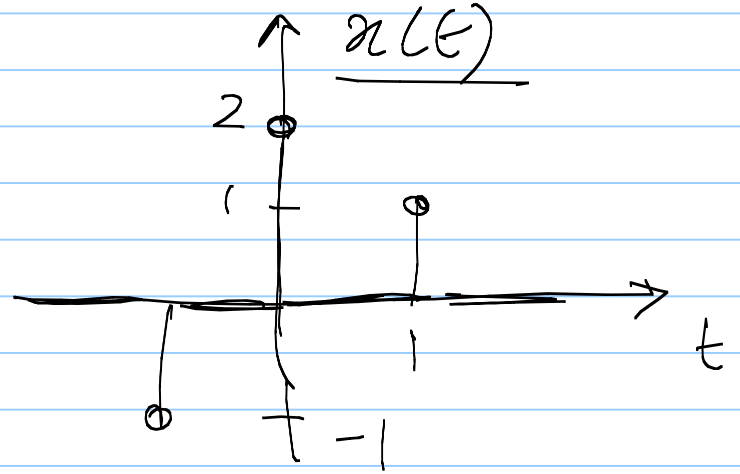
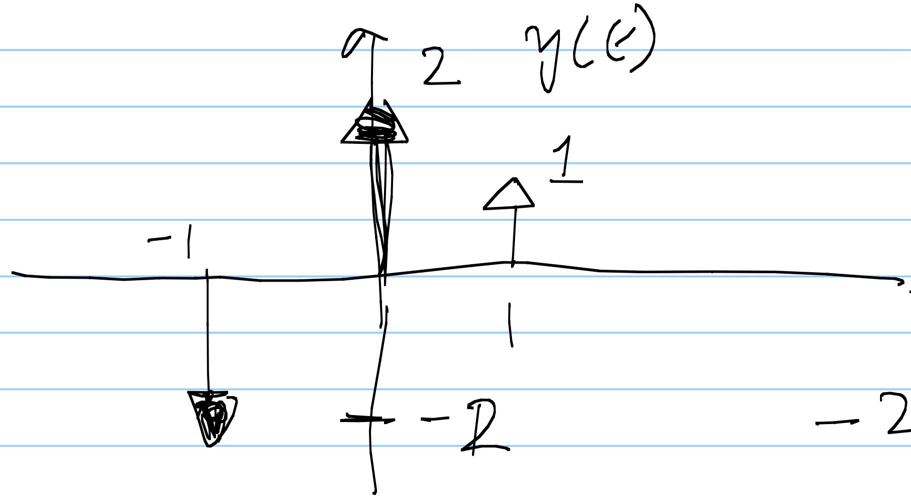
EC 5142 9th Aug. 2011



$x(1) = 1$

$x(0) = 2 \neq 2\delta(t)$

$\int_{-\infty}^{\infty} x(t)\,dt = 0$



$\int_{-\infty}^{\infty} y(t)\,dt .$

$-2+2+1 = \underline{1}$

$$f(x) = \begin{cases} 1 & x \text{ is irrational} \\ 0 & x \text{ is rational} \end{cases}$$

$$e^{j\omega_0 n} = x[n]$$

$$x[n+N] = x[n] \Rightarrow \underbrace{\frac{\omega_0}{2\pi}}_{f_0} = \frac{k}{N}$$

$e^{j\Omega_0 t}$ is always periodic w/ periodic

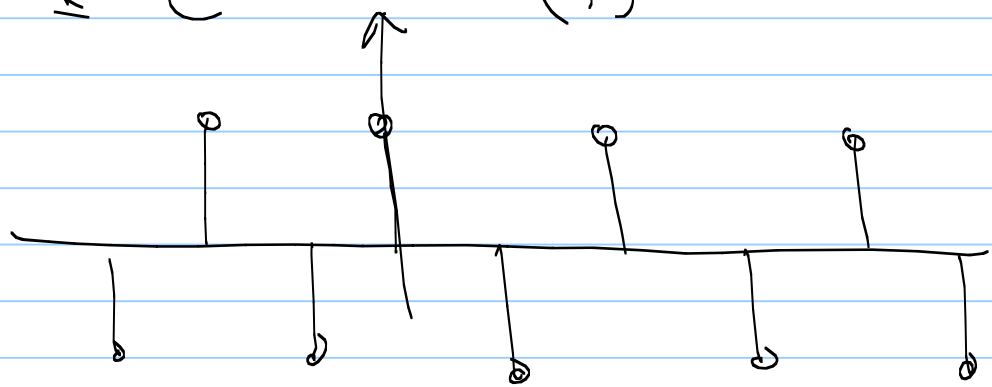
$$T = \frac{2\pi}{|\Omega_0|}$$

$$e^{j(\omega_0+2\pi)n} = e^{j\omega_0 n}$$

If $\omega_0 = 0$ $\quad e^{j\omega_0 n} = \underline{1} \quad \forall n$

If $\omega_0 = 2\pi$ $\quad , e^{j2\pi n} = 1 \quad \forall n$

$$e^{j\pi n} = e^{-j\pi n} = (-1)^n$$



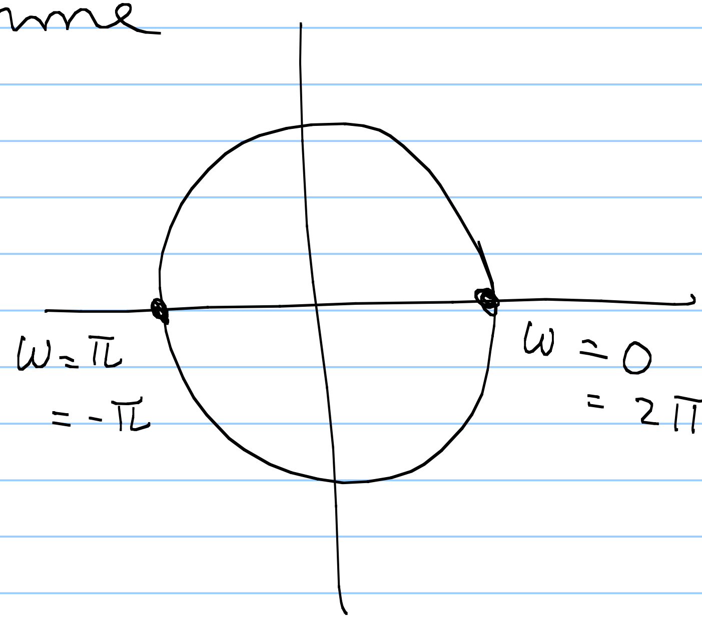
$$e^{j\,1.1\pi n} = \cos(1.1\pi n) + j\sin(1.1\pi n)$$

$$e^{jn} = \text{not periodic in time}$$

$$= e^{j(1+2\pi)n}$$

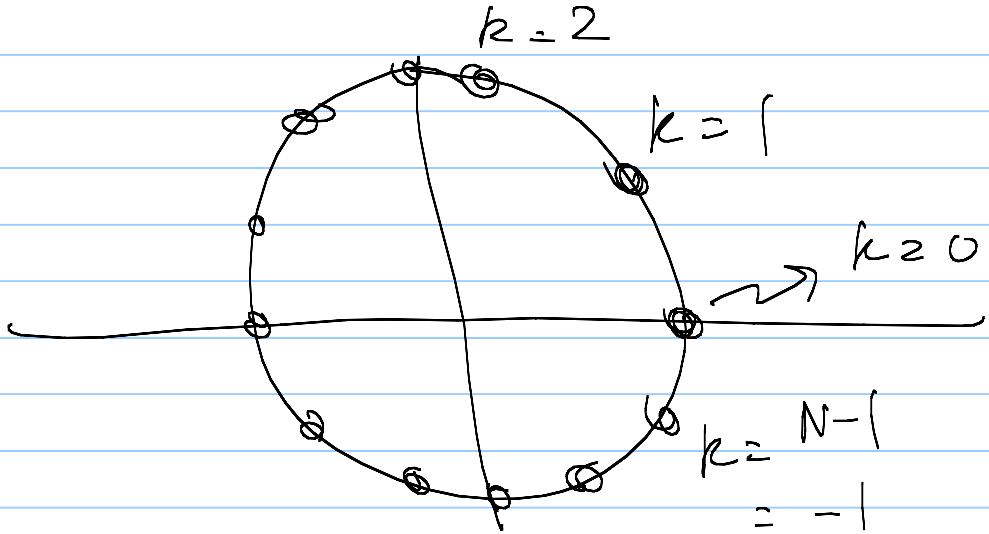
$$e^{j\omega_0 n}\,, \quad \frac{\omega_0}{2\pi} = \frac{k}{N}$$

$$f_0 \rightarrow (0,1)$$



$$f_0 = \overbrace{0, \frac{1}{N}, \frac{2}{N}, \frac{3}{N}, \ldots, \frac{N-1}{N}}, N$$

N distinct complex exponential



$e^{j\omega_0 n}$ & $e^{-j\omega_0 n}$ are two linearly independent signals.

$$x_1[n] = e^{j\omega_0 n} = \cos\omega_0 n + j\sin\omega_0 n$$

$$x_2[n] = e^{-j\omega_0 n} = \cos\omega_0 n - j\sin\omega_0 n$$

$$a_1 x_1[n] + a_2 x_2[n] = 0$$

$$\Rightarrow a_1 = a_2 = 0 \qquad a_1, a_2 \in \mathbb{C}$$

$$\cos \omega_0 n = \frac{1}{2} e^{j\omega_0 n} + \frac{1}{2} e^{-j\omega_0 n}$$

$$\xrightarrow{} k=1 \qquad \xrightarrow{} k=-1 = N-1$$

$$\cos 2\pi \frac{1}{N} n \qquad \cos 2\pi \frac{-1}{N} n$$

$$\underbrace{2\pi f_0}_{\omega_0} n$$

$$\sin 2\pi \frac{1}{N} n \qquad \sin 2\pi \frac{-1}{N} n$$