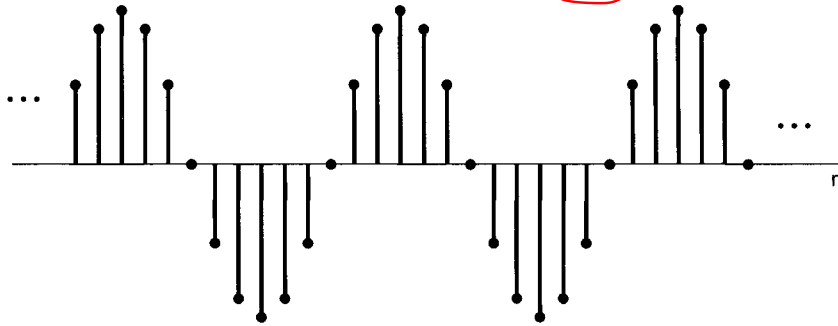


$\left(\frac{1}{\omega_0}\right) \frac{\omega_0}{2\pi}$  : rational no ?

$$\hat{\omega}_0 = \frac{2\pi}{12}$$

$$x[n] = \cos(2\pi n/12)$$

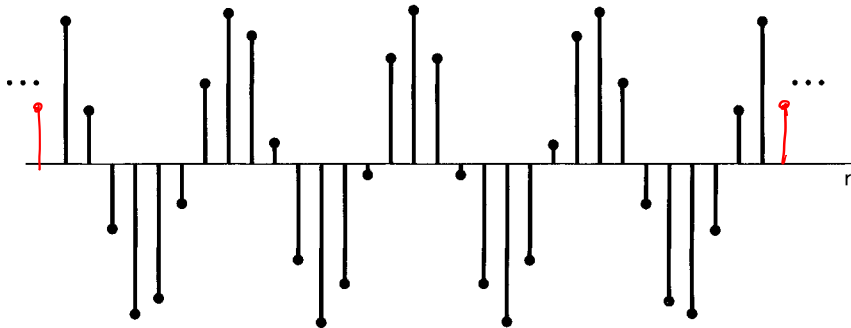


$$N = 12$$

(a)

$$\hat{\omega}_0 = \frac{8\pi}{31}$$

$$x[n] = \cos(8\pi n/31)$$

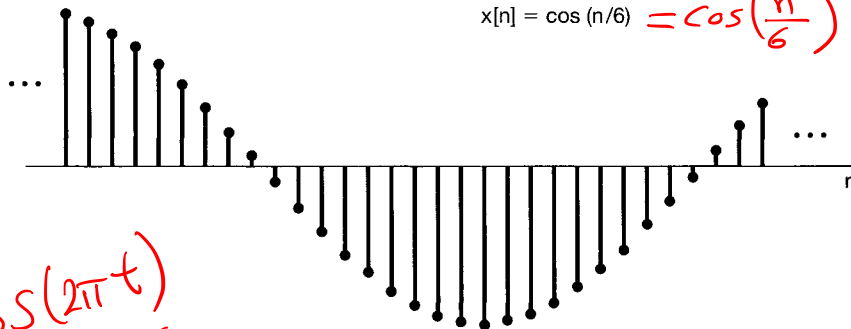


$$N = 31$$

(b)

$$\hat{\omega}_0 = \frac{1}{12\pi} \rightarrow \text{not rational!}$$

$$x[n] = \cos(n/6) = \cos\left(\frac{n}{6}\right)$$



(c)

not periodic

$$x(t) = \cos(2\pi t)$$

Figure 1.25 Discrete-time sinusoidal signals.

### General Complex Exponential Signals

The general discrete-time complex exponential can be written and interpreted in terms of real exponentials and sinusoidal signals. Specifically, if we write  $C$  and  $\alpha$  in polar form,