2022sep02

Friday, September 2, 2022 13:16

$\cos(2\pi F_N t)$

$F_N \quad \left[\frac{\text{cycles}}{\text{second}}\right] = [\text{Hertz}]$

$2\pi \quad \left[\frac{\text{radians}}{\text{cycle}}\right]$

$2\pi F_N \quad \left[\frac{\text{radians}}{\text{cycle}}\right]\left[\frac{\text{cycles}}{\text{second}}\right] = \left[\frac{\text{radians}}{\text{second}}\right]$

$t = \frac{n}{F_s}$

$F_s \quad \left[\frac{\text{samples}}{\text{second}}\right]$

$n \quad [\text{samples}]$

$\frac{n}{F_s} \quad \frac{[\text{samples}]}{\left[\frac{\text{samples}}{\text{second}}\right]} = [\text{seconds}]$

$\cos\left(2\pi F_N \frac{n}{F_s}\right)$

$2\pi F_N \frac{n}{F_s} \quad \left[\frac{\text{radians}}{\text{cycle}}\right]\left[\frac{\text{cycles}}{\text{second}}\right]\frac{[\text{samples}]}{\left[\frac{\text{samples}}{\text{second}}\right]} = [\text{radians}]$

$$2\pi F_N \frac{1}{F_S} \quad \left[\frac{\text{rad}}{\text{cyc}}\right]\left[\frac{\text{cyc}}{\text{sec}}\right]\frac{1}{\left[\frac{\text{sam}}{\text{sec}}\right]} = \left[\frac{\text{radians}}{\text{sample}}\right]$$

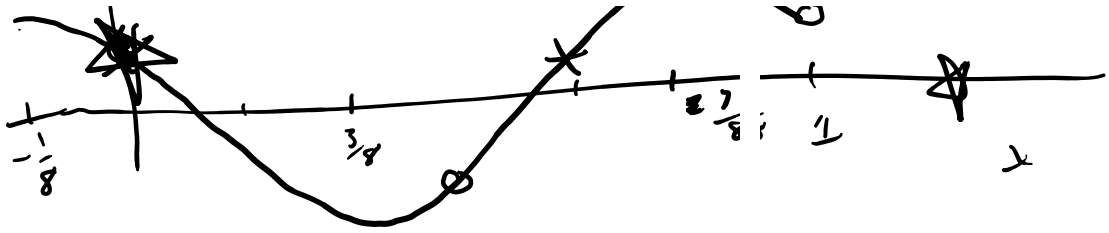
$$\omega = 2\pi F_N \frac{1}{F_S} \qquad \left[\frac{\text{radians}}{\text{sample}}\right]$$

$$\frac{1}{2}\left[\frac{\text{cycle}}{\text{sample}}\right] \cdot 2\pi \left[\frac{\text{radians}}{\text{cycle}}\right]$$

$$= \pi \left[\frac{\text{radians}}{\text{sample}}\right]$$

Slides example

$$x(t) = \cos(2\pi t + \frac{\pi}{4}) = \cos(2\pi(t + \frac{1}{8}))$$



$$x[n] = \cos\left(2\pi\left(\frac{n}{2}\right) + \frac{\pi}{4}\right)$$

$$= \cos\left(\pi n + \frac{\pi}{4}\right)$$