Digital Signal Processing

Periodic Sampling

$$x(n) = \sin(2\pi n f / f_s) = \sin(2\pi n (f + k f_s)/f_s) \qquad k \in \mathbb{Z}$$

Continuous Fourier Transform

$$X(f) = \int_{-\infty}^{+\infty} x(t) e^{-i2\pi f t} dt$$

Discrete Fourier Transform

$$X(m) = \sum_{n=1}^{N-1} x(n) e^{-i2\pi n m/N} \qquad 0 \le m \le N$$

$$\text{frequency}(m) = \frac{m f_s}{N}$$

$$\text{amplitude}(m) = \frac{2}{N} |X(m)|$$

$$\text{phase angle}(m) = \text{argument}\big(X(m)\big)$$

For real inputs, $X(m)$ is the complex conjugate of $X(N-m)$.

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