Appendix A. Discrete Fourier Transform (DFT)

used for:	finite-length signals, $x[n] \in \mathbb{C}^N$
analysis formula:	$X[k] = \sum_{n=0}^{N-1} x[n] e^{-j\frac{2\pi}{N}nk}, \quad k = 0, \ldots, N-1$
synthesis formula:	$x[n] = \frac{1}{N}\sum_{k=0}^{N-1} X[k] e^{j\frac{2\pi}{N}nk}, \quad n = 0, \ldots, N-1$
time and frequency reversal:	$x[-n \mod N] \overset{\text{DFT}}{\longleftrightarrow} X[-k \mod N]$
	$x^*[n] \overset{\text{DFT}}{\longleftrightarrow} X^*[-k \mod N]$
circular shifts:	$x[(n-n_0) \mod N] \overset{\text{DFT}}{\longleftrightarrow} e^{-j\frac{2\pi}{N}n_0 k} X[k]$
	$e^{j\frac{2\pi}{N}nk_0} x[n] \overset{\text{DFT}}{\longleftrightarrow} X[(k-k_0) \mod N]$
energy conservation:	$\sum_{n=0}^{N-1} \lvert x[n]\rvert^2 = \frac{1}{N}\sum_{k=0}^{N-1} \lvert X[k]\rvert^2$

Appendix B. Notable DFT Pairs

$(n, k = 0, 1, \ldots, N-1)$

$x[n] = \delta[n-L]$	$X[k] = e^{-j\frac{2\pi}{N}Lk}$
$x[n] = 1$	$X[k] = N\delta[k]$
$x[n] = e^{j\frac{2\pi}{N}Ln}$	$X[k] = N\delta[k-L]$
$x[n] = \cos\left(\frac{2\pi}{N}Ln + \phi\right)$	$X[k] = (N/2)[e^{j\phi}\delta[k-L] + e^{-j\phi}\delta[k-N+L]]$
$x[n] = \sin\left(\frac{2\pi}{N}Ln + \phi\right)$	$X[k] = (-jN/2)[e^{j\phi}\delta[k-L] - e^{-j\phi}\delta[k-N+L]]$
$x[n] = \begin{cases} 1 & n < M \\ 0 & M \le n < N \end{cases}$	$X[k] = \frac{\sin((\pi/N)Mk)}{\sin((\pi/N)k)} e^{-j\frac{\pi}{N}(M-1)k}$