TABLE 9.1 A Short Table of Discrete-Time Fourier Transforms

No.	$x[n]$	$X(\Omega)$	
1	$\delta[n-k]$	$e^{-jk\Omega}$	Integer k
2	$\gamma^n u[n]$	$\dfrac{e^{j\Omega}}{e^{j\Omega}-\gamma}$	$\lvert\gamma\rvert < 1$
3	$-\gamma^n u[-(n+1)]$	$\dfrac{e^{j\Omega}}{e^{j\Omega}-\gamma}$	$\lvert\gamma\rvert > 1$
4	$\gamma^{\lvert n\rvert}$	$\dfrac{1-\gamma^2}{1-2\gamma\cos\Omega+\gamma^2}$	$\lvert\gamma\rvert < 1$
5	$n\gamma^n u[n]$	$\dfrac{\gamma e^{j\Omega}}{(e^{j\Omega}-\gamma)^2}$	$\lvert\gamma\rvert < 1$
6	$\gamma^n \cos(\Omega_0 n+\theta)u[n]$	$\dfrac{e^{j\Omega}[e^{j\Omega}\cos\theta-\gamma\cos(\Omega_0-\theta)]}{e^{j2\Omega}-(2\gamma\cos\Omega_0)e^{j\Omega}+\gamma^2}$	$\lvert\gamma\rvert < 1$
7	$u[n]-u[n-M]$	$\dfrac{\sin(M\Omega/2)}{\sin(\Omega/2)}e^{-j\Omega(M-1)/2}$	
8	$\dfrac{\Omega_c}{\pi}\text{sinc}\left(\dfrac{\Omega_c n}{\pi}\right)$	$\displaystyle\sum_{k=-\infty}^{\infty}\text{rect}\left(\dfrac{\Omega-2\pi k}{2\Omega_c}\right)$	$\Omega_c \le \pi$
9	$\dfrac{\Omega_c}{\pi}\text{sinc}^2\left(\dfrac{\Omega_c n}{\pi}\right)$	$\displaystyle\sum_{k=-\infty}^{\infty}\Delta\left(\dfrac{\Omega-2\pi k}{2\Omega_c}\right)$	$\Omega_c \le \pi$
10	$u[n]$	$\dfrac{e^{j\Omega}}{e^{j\Omega}-1}+\pi\displaystyle\sum_{k=-\infty}^{\infty}\delta(\Omega-2\pi k)$	
11	1 for all n	$2\pi\displaystyle\sum_{k=-\infty}^{\infty}\delta(\Omega-2\pi k)$	
12	$e^{j\Omega_0 n}$	$2\pi\displaystyle\sum_{k=-\infty}^{\infty}\delta(\Omega-\Omega_0-2\pi k)$	
13	$\cos\Omega_0 n$	$\pi\displaystyle\sum_{k=-\infty}^{\infty}\delta(\Omega-\Omega_0-2\pi k)+\delta(\Omega+\Omega_0-2\pi k)$	
14	$\sin\Omega_0 n$	$j\pi\displaystyle\sum_{k=-\infty}^{\infty}\delta(\Omega+\Omega_0-2\pi k)-\delta(\Omega-\Omega_0-2\pi k)$	

TABLE 9.2 Properties of the DTFT

Operation	$x[n]$	$X(\Omega)$	
Linearity	$a_1x_1[n]+a_2x_2[n]$	$a_1X_1(\Omega)+a_2X_2(\Omega)$	
Conjugation	$x^*[n]$	$X^*(-\Omega)$	
Scalar multiplication	$ax[n]$	$aX(\Omega)$	
Multiplication by n	$nx[n]$	$j\dfrac{dX(\Omega)}{d\Omega}$	
Time reversal	$x[-n]$	$X(-\Omega)$	
Time shifting	$x[n-k]$	$X(\Omega)e^{-jk\Omega}$	k integer
Frequency shifting	$x[n]\,e^{j\Omega_c n}$	$X(\Omega-\Omega_c)$	
Time convolution	$x_1[n]*x_2[n]$	$X_1(\Omega)X_2(\Omega)$	
Frequency convolution	$x_1[n]x_2[n]$	$\dfrac{1}{2\pi}\displaystyle\int_{2\pi}X_1[u]X_2[\Omega-u]\,du$	
Parseval's theorem	$E_x=\displaystyle\sum_{n=-\infty}^{\infty}\lvert x[n]\rvert^2$	$E_x=\dfrac{1}{2\pi}\displaystyle\int_{2\pi}\lvert X(\Omega)\rvert^2\,d\Omega$	