Fourier Transform Table

Time Signal	Fourier Transform
$1, \quad -\infty < t < \infty$	$2\pi\delta(\omega)$
$-0.5 + u(t)$	$1/j\omega$
$u(t)$	$\pi\delta(\omega) + 1/j\omega$
$\delta(t)$	$1, \quad -\infty < \omega < \infty$
$\delta(t-c), \quad c$ real	$e^{-j\omega c}, \quad c$ real
$e^{-bt}u(t), \quad b > 0$	$\frac{1}{j\omega + b}, \quad b > 0$
$e^{j\omega_o t}, \quad \omega_o$ real	$2\pi\delta(\omega - \omega_o), \quad \omega_o$ real
$p_\tau(t)$	$\tau \operatorname{sinc}[\tau\omega / 2\pi]$
$\tau \operatorname{sinc}[\tau t / 2\pi]$	$2\pi p_\tau(\omega)$
$\left[1 - \frac{2\|t\|}{\tau}\right] p_\tau(t)$	$\frac{\tau}{2}\operatorname{sinc}^2[\tau\omega / 4\pi]$
$\frac{\tau}{2}\operatorname{sinc}^2[\tau t / 4\pi]$	$2\pi\left[1 - \frac{2\|\omega\|}{\tau}\right] p_\tau(\omega)$
$\cos(\omega_o t)$	$\pi[\delta(\omega + \omega_o) + \delta(\omega - \omega_o)]$
$\cos(\omega_o t + \theta)$	$\pi[e^{-j\theta}\delta(\omega + \omega_o) + e^{j\theta}\delta(\omega - \omega_o)]$
$\sin(\omega_o t)$	$j\pi[\delta(\omega + \omega_o) - \delta(\omega - \omega_o)]$
$\sin(\omega_o t + \theta)$	$j\pi[e^{-j\theta}\delta(\omega + \omega_o) - e^{j\theta}\delta(\omega - \omega_o)]$

Fourier Transform Properties

Property Name	Property	
Linearity	$ax(t)+bv(t)$	$aX(\omega)+bV(\omega)$
Time Shift	$x(t-c)$	$e^{-j\omega c}X(\omega)$
Time Scaling	$x(at), \quad a \neq 0$	$\frac{1}{a}X(\omega/a), \quad a \neq 0$
Time Reversal	$x(-t)$	$X(-\omega)$ $\overline{X(\omega)}$ if $x(t)$ is real
Multiply by t^n	$t^n x(t), \quad n=1, 2, 3, \ldots$	$j^n \dfrac{d^n}{d\omega^n}X(\omega), \quad n=1, 2, 3, \ldots$
Multiply by Complex Exponential	$e^{j\omega_o t}x(t), \quad \omega_o$ real	$X(\omega-\omega_o), \quad \omega_o$ real
Multiply by Sine	$\sin(\omega_o t)x(t)$	$\dfrac{j}{2}\left[X(\omega+\omega_o)-X(\omega-\omega_o)\right]$
Multiply by Cosine	$\cos(\omega_o t)x(t)$	$\dfrac{1}{2}\left[X(\omega+\omega_o)+X(\omega-\omega_o)\right]$
Time Differentiation	$\dfrac{d^n}{dt^n}x(t), \quad n=1, 2, 3, \ldots$	$(j\omega)^n X(\omega), \quad n=1, 2, 3, \ldots$
Time Integration	$\int_{-\infty}^{t} x(\lambda)d\lambda$	$\dfrac{1}{j\omega}X(\omega)+\pi X(0)\delta(\omega)$
Convolution in Time	$x(t)*h(t)$	$X(\omega)H(\omega)$
Multiplication in Time	$x(t)w(t)$	$\dfrac{1}{2\pi}X(\omega)*W(\omega)$
Parseval's Theorem (General)	$\int_{-\infty}^{\infty} x(t)\overline{v(t)}dt = \dfrac{1}{2\pi}\int_{-\infty}^{\infty} X(\omega)\overline{V(\omega)}d\omega$	
Parseval's Theorem (Energy)	$\int_{-\infty}^{\infty} x^2(t)dt = \dfrac{1}{2\pi}\int_{-\infty}^{\infty} \lvert X(\omega)\rvert^2 d\omega$ if $x(t)$ is real $\int_{-\infty}^{\infty} \lvert x(t)\rvert^2 dt = \dfrac{1}{2\pi}\int_{-\infty}^{\infty} \lvert X(\omega)\rvert^2 d\omega$	
Duality: If $x(t) \leftrightarrow X(\omega)$	$X(t)$	$2\pi x(-\omega)$