Fourier Transform Properties

Property	$g(t) \Leftrightarrow G(f)$	
Linearity	$\alpha_1 g_1(t) + \alpha_2 g_2(t)$	$\alpha_1 G_1(f) + \alpha_2 G_2(f)$
Time Scaling	$g(at)$	$\frac{1}{\lvert a \rvert} . G(\frac{f}{a})$
	$g(\frac{t}{a})$	$a.G(af)$
Duality	$G(t)$	$g(-f)$
	$G(-t)$	$g(f)$
Shifting	$g(t \pm t_o)$	$G(f).e^{\pm j2\pi f.t_o}$
	$g(t).e^{\mp j2\pi t.f_o}$	$G(f \pm f_o)$
Differentiation	$\frac{d^n}{dt^n} g(t)$	$(j2\pi f)^n G(f)$
	$(-j2\pi t)^n g(t)$	$\frac{d^n}{df^n} G(f)$
Integration	$\int_{-\infty}^{t} g(\tau) d\tau$	$\frac{G(f)}{j2\pi f} + \frac{1}{2} G(0).\delta(f)$
	$\frac{g(t)}{-j2\pi t} + \frac{1}{2} g(0).\delta(t)$	$\int_{-\infty}^{f} G(\lambda) d\lambda$
Multiplication	$g_1(t).g_2(t)$	$G_1(f) \otimes G_2(f)$
	$g_1(t) \otimes g_2(t)$	$G_1(f).G_2(f)$
Conjugate	$g^*(t)$	$G(-f)$
Area	$\int_{-\infty}^{\infty} g(t).dt$	$G(0)$
	$g(0)$	$\int_{-\infty}^{\infty} G(f).df$

Fourier Transform Pairs

g(t)	G(f)
$rect(\frac{t}{\tau})$	$\tau.\sin c(\tau f)$
$tri(\frac{t}{\tau})$	$\tau.\sin c^{2}(\tau f)$
$e^{-at}u(t)$	$\frac{1}{a+j2\pi f}$
$e^{+at}u(-t)$	$\frac{1}{a-j2\pi f}$
$e^{-a\|t\|}$	$\frac{2a}{a^{2}+\omega^{2}}$
$\delta(t)$	1
1	$\delta(f)$
$\cos(2\pi f_{o}t)$	$\frac{1}{2}[\delta(f-f_{o})+\delta(f+f_{o})]$
$\sin(2\pi f_{o}t)$	$\frac{1}{2j}[\delta(f-f_{o})-\delta(f+f_{o})]$
$\mathrm{sgn}(t)$	$\frac{1}{j\pi f}$
$\frac{1}{-j\pi t}$	$\mathrm{sgn}(f)$
$u(t)$	$\frac{1}{2}\delta(f)+\frac{1}{j2\pi f}$
$\sum_{n=-\infty}^{\infty}\delta(t-nT_{o})$	$f.\sum_{k=-\infty}^{\infty}\delta(f-kf_{o})$

Trigonometric identities

<table>
<tr><td colspan="2">$e^{\pm jx} = \cos(x) \pm \sin(x)$</td></tr>
<tr><td>$\cos(x) = \frac{1}{2}\left[e^{jx} + e^{-jx}\right]$</td><td>$\sin(x) = \frac{1}{2j}\left[e^{jx} - e^{-jx}\right]$</td></tr>
<tr><td colspan="2">$\cos^2(x) + \sin^2(x) = 1$</td></tr>
<tr><td>$\cos^2(x) = \frac{1}{2}\left[1 + \cos(2x)\right]$</td><td>$\sin^2(x) = \frac{1}{2}\left[1 - \cos(2x)\right]$</td></tr>
<tr><td>$\sin(2x) = 2\sin(x).\cos(x)$</td><td>$\cos(2x) = \cos^2(x) - \sin^2(x)$</td></tr>
<tr><td colspan="2">$\cos(A \pm B) = \cos(A)\cos(B) \mp \sin(A)\sin(B)$</td></tr>
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Fourier Transform Properties

Fourier Transform Pairs

Trigonometric identities

Eng. Sherif ElDyasti