Fourier Transform: Let $G(f)$ denote the Fourier Transform of the signal $g(t)$. Then:

$$G(f) = \int_{-\infty}^{\infty} g(t)e^{-j2\pi ft}dt \qquad \text{and} \qquad g(t) = \int_{-\infty}^{\infty} G(f)e^{j2\pi ft}df$$

Selected Fourier Transform Properties

Property	Mathematical Description
	If $g(t) \leftrightarrows G(f)$ then:
Area under $g(t)$	$\int_{-\infty}^{\infty} g(t)dt = G(0)$
Area under $G(f)$	$g(0) = \int_{-\infty}^{\infty} G(f)df$
Time Shifting	$g(t - t_0) \leftrightarrows G(f)e^{-j2\pi ft_0}$
Frequency Shifting	$g(t)e^{-j2\pi f_0 t} \leftrightarrows G(f + f_0)$
Linearity	$ag_1(t) + bg_2(t) \leftrightarrows aG_1(f) + bG_2(f)$
Time Scaling	$g(at) \leftrightarrows \frac{1}{\lvert a \rvert}G\left(\frac{f}{a}\right)$
Duality	$G(t) \leftrightarrows g(-f)$
Conjugate Functions	$g^*(t) \leftrightarrows G^*(-f)$
Multiplication in time	$g_1(t)g_2(t) \leftrightarrows G_1(f) * G_2(f)$
Convolution in time	$g_1(t) * g_2(t) \leftrightarrows G_1(f)G_2(f)$
Area under product	$\int_{-\infty}^{\infty} g_1(t)g_2(t)dt = \int_{-\infty}^{\infty} G_1(f)G_2(-f)df$
Integration in time	$\int_{-\infty}^{t} g(\tau)d\tau \leftrightarrows \frac{1}{j2\pi f}G(f) + \frac{1}{2}G(0)\delta(f)$
Differentiation in time	$\frac{d}{dt}g(t) \leftrightarrows j2\pi fG(f)$

Convolution Integral: $f(t) * g(t) = \int_{-\infty}^{\infty} f(\tau)g(t - \tau)d\tau$

Real-Imaginary/Even-Odd Properties of Fourier Transform Pairs			
	Function of Time	Fourier Transform	
(L1)	real and even	real and even	(L1)
(L1)	real and odd	imaginary and odd	(L1)
(L1)	imaginary and even	imaginary and even	(L1)
(L1)	imaginary and odd	real and odd	(L1)
(L2)	odd	odd	(L2)
(L2)	even	even	(L2)
(L2)	real	Hermitian (real part even, imaginary part odd) (magnitude even, phase odd)	(L2)
(L2)	imaginary	antiHermitian (real part odd, imaginary part even)	(L2)
(L2)	Hermitian (real part even, imaginary part odd)	real	(L2)
(L2)	antiHermitian (real part odd, imaginary part even)	imaginary	(L2)
(L3)	complex	complex	(L3)

Algorithm for finding most specific characterization of a signal. (Note that in the table above, Level 1 (L1) characterizations are the most specific followed by L2 and then L3.)