

## Table of Fourier Transforms and Properties

FOURIER TRANSFORMS OF BASIC FUNCTIONS		
	$x(t)$	$X(f)$
Constant	$K$	$K\delta(f)$
Unit Impulse	$\delta(t)$	<b>1</b>
Unit Step	$u(t)$	$\frac{1}{2}\left[\delta(f) + \frac{1}{j\pi f}\right]$
Sign (or Signum)	$\text{sgn}(t)$	$\frac{1}{j\pi f}$
Rectangle	$\text{rect}\left(\frac{t}{T}\right)$	$T \text{sinc}(fT)$
Triangle	$\text{tri}\left(\frac{t}{T}\right)$	$T \text{sinc}^2(fT)$
Sine Cardinal	$\text{sinc}\left(\frac{t}{T}\right)$	$T \text{rect}(fT)$
Complex Exponential	$\exp(j2\pi f_o t)$	$\delta(f - f_o)$
Cosine	$\cos(2\pi f_o t)$	$\frac{1}{2}[\delta(f - f_o) + \delta(f + f_o)]$
Sine	$\sin(2\pi f_o t)$	$-\frac{j}{2}[\delta(f - f_o) - \delta(f + f_o)]$
Gaussian	$\exp\left(-\frac{t^2}{\alpha^2}\right)$	$\alpha\pi^{0.5} \exp(-\alpha^2\pi^2 f^2)$
Comb	$\sum_{m=-\infty}^{\infty} \delta(t - mT)$	$\frac{1}{T} \sum_{k=-\infty}^{\infty} \delta\left(f - \frac{k}{T}\right)$

FOURIER TRANSFORM PROPERTIES		
	Time-domain	Frequency-domain
Linearity	$\alpha x_1(t) + \beta x_2(t)$	$\alpha X_1(f) + \beta X_2(f)$
Time scaling	$x(\beta t)$	$\frac{1}{ \beta } X\left(\frac{f}{\beta}\right)$
Duality	$X(t)$	$x(-f)$
Time shifting	$x(t - t_o)$	$X(f) \exp(-j2\pi f t_o)$
Frequency shifting (Modulation)	$x(t) \exp(j2\pi f_o t)$	$X(f - f_o)$
Differentiation in the time-domain	$\frac{d^n}{dt^n} x(t)$	$(j2\pi f)^n X(f)$
Multiplication in the time-domain	$x_1(t)x_2(t)$	$\int_{-\infty}^{\infty} X_1(\zeta) X_2(f - \zeta) d\zeta$ or $X_1(f) * X_2(f)$
Convolution in the time-domain	$\int_{-\infty}^{\infty} x_1(\zeta) x_2(t - \zeta) d\zeta$ or $x_1(t) * x_2(t)$	$X_1(f) X_2(f)$
Integration in the time-domain	$\int_{-\infty}^t x(\tau) d\tau$	$\frac{1}{j2\pi f} X(f) + \frac{1}{2} X(0) \delta(f)$
		$\frac{1}{j2\pi f} X(f) \quad \text{if } X(0) = 0$