

**TABLE 3.1**  
Short Table of Fourier Transforms

$g(t)$	$G(f)$	
1 $e^{-at}u(t)$	$\frac{1}{a + j2\pi f}$	$a > 0$
2 $e^{at}u(-t)$	$\frac{1}{a - j2\pi f}$	$a > 0$
3 $e^{-a t }$	$\frac{2a}{a^2 + (2\pi f)^2}$	$a > 0$
4 $te^{-at}u(t)$	$\frac{1}{(a + j2\pi f)^2}$	$a > 0$
5 $t^n e^{-at}u(t)$	$\frac{n!}{(a + j2\pi f)^{n+1}}$	$a > 0$
6 $\delta(t)$	1	
7 1	$\delta(f)$	
8 $e^{j2\pi f_0 t}$	$\delta(f - f_0)$	
9 $\cos 2\pi f_0 t$	$0.5[\delta(f + f_0) + \delta(f - f_0)]$	
10 $\sin 2\pi f_0 t$	$j0.5[\delta(f + f_0) - \delta(f - f_0)]$	
11 $u(t)$	$\frac{1}{j2\pi f} + \frac{1}{2}\delta(f)$	
12 $\text{sgn } t$	$\frac{2}{j2\pi f}$	
13 $\cos 2\pi f_0 t u(t)$	$\frac{1}{4}[\delta(f - f_0) + \delta(f + f_0)] + \frac{j2\pi f}{(2\pi f_0)^2 - (2\pi f)^2}$	
14 $\sin 2\pi f_0 t u(t)$	$\frac{1}{4j}[\delta(f - f_0) - \delta(f + f_0)] + \frac{2\pi f_0}{(2\pi f_0)^2 - (2\pi f)^2}$	
15 $e^{-at} \sin 2\pi f_0 t u(t)$	$\frac{2\pi f_0}{(a + j2\pi f)^2 + 4\pi^2 f_0^2}$	$a > 0$
16 $e^{-at} \cos 2\pi f_0 t u(t)$	$\frac{a + j2\pi f}{(a + j2\pi f)^2 + 4\pi^2 f_0^2}$	$a > 0$
17 $\Pi\left(\frac{t}{\tau}\right)$	$\tau \text{sinc}(\pi f \tau)$	
18 $2B \text{sinc}(2\pi Bt)$	$\Pi\left(\frac{f}{2B}\right)$	
19 $\Delta\left(\frac{t}{\tau}\right)$	$\frac{\tau}{2} \text{sinc}^2\left(\frac{\pi f \tau}{2}\right)$	
20 $B \text{sinc}^2(\pi Bt)$	$\Delta\left(\frac{f}{2B}\right)$	
21 $\sum_{n=-\infty}^{\infty} \delta(t - nT)$	$f_0 \sum_{n=-\infty}^{\infty} \delta(f - nf_0)$	$f_0 = \frac{1}{T}$
22 $e^{-t^2/2\sigma^2}$	$\sigma\sqrt{2\pi}e^{-2(\sigma\pi f)^2}$	

**TABLE 3.2**  
Properties of Fourier Transform Operations

Operation	$g(t)$	$G(f)$
Superposition	$g_1(t) + g_2(t)$	$G_1(f) + G_2(f)$
Scalar multiplication	$kg(t)$	$kG(f)$
Duality	$G(t)$	$g(-f)$
Time scaling	$g(at)$	$\frac{1}{ a } G\left(\frac{f}{a}\right)$
Time shifting	$g(t - t_0)$	$G(f)e^{-j2\pi f t_0}$
Frequency shifting	$g(t)e^{j2\pi f_0 t}$	$G(f - f_0)$
Time convolution	$g_1(t) * g_2(t)$	$G_1(f)G_2(f)$
Frequency convolution	$g_1(t)g_2(t)$	$G_1(f) * G_2(f)$
Time differentiation	$\frac{d^n g(t)}{dt^n}$	$(j2\pi f)^n G(f)$
Time integration	$\int_{-\infty}^t g(x) dx$	$\frac{G(f)}{j2\pi f} + \frac{1}{2}G(0)\delta(f)$