Table of Fourier Transforms

$$f(x) = \frac{1}{\sqrt{2\pi}} \int_{-\infty}^{\infty} \hat{f}(\omega)e^{ix\omega}\, d\omega \qquad\qquad \hat{f}(\omega) = \mathcal{F}(f)(\omega) = \frac{1}{\sqrt{2\pi}} \int_{-\infty}^{\infty} f(x)e^{-i\omega x}\, dx$$

1. $\begin{cases} 1 & \text{if } |x| < a \\ 0 & \text{if } |x| > a \end{cases}$
   $\qquad\qquad \sqrt{\dfrac{2}{\pi}}\,\dfrac{\sin a\omega}{\omega}$

2. $\begin{cases} 1 & \text{if } a < x < b \\ 0 & \text{otherwise} \end{cases}$
   $\qquad\qquad \dfrac{i\left(e^{-ib\omega} - e^{ia\omega}\right)}{\sqrt{2\pi}\,\omega}$

3. $\begin{cases} 1 - \frac{|x|}{a} & \text{if } |x| < a \\ 0 & \text{if } |x| > a \end{cases} \quad a > 0$
   $\qquad\qquad 2\sqrt{\dfrac{2}{\pi}}\,\dfrac{\sin^2\left(\frac{a\omega}{2}\right)}{a\omega^2}$

4. $\begin{cases} x & \text{if } |x| < a \\ 0 & \text{if } |x| > a \end{cases} \quad a > 0$
   $\qquad\qquad i\sqrt{\dfrac{2}{\pi}}\,\dfrac{a\omega\cos(a\omega) - \sin(a\omega)}{\omega^2}$

5. $\begin{cases} \sin x & \text{if } |x| < \pi \\ 0 & \text{if } |x| > \pi \end{cases}$
   $\qquad\qquad i\sqrt{\dfrac{2}{\pi}}\,\dfrac{\sin(\pi\omega)}{\omega^2 - 1}$

6. $\begin{cases} \sin(ax) & \text{if } |x| < b \\ 0 & \text{if } |x| > b \end{cases} \quad a,b > 0$
   $\qquad i\sqrt{\dfrac{2}{\pi}}\,\dfrac{\omega\cos(b\omega)\sin(ab) - a\cos(ab)\sin(b\omega)}{\omega^2 - a^2}$

7. $\dfrac{1}{a^2 + x^2}, \quad a > 0$
   $\qquad\qquad \sqrt{\dfrac{\pi}{2}}\,\dfrac{e^{-a|\omega|}}{a}$

8. $\dfrac{x}{a^2 + x^2}, \quad a > 0$
   $\qquad\qquad -i\sqrt{\dfrac{\pi}{2}}\,\mathrm{sgn}\,\omega\, e^{-a|\omega|}$

9. $\sqrt{\dfrac{2}{\pi}}\,\dfrac{a}{1 + a^2 x^2}, \quad a > 0$
   $\qquad\qquad e^{-\frac{|\omega|}{a}}$

10. $\dfrac{\sin ax}{x}, \quad a > 0$
    $\qquad\qquad \begin{cases} \sqrt{\frac{\pi}{2}} & \text{if } |\omega| < a \\ \frac{1}{2}\sqrt{\frac{\pi}{2}} & \text{if } |\omega| = a \\ 0 & \text{if } |\omega| > a \end{cases}$

11. $\dfrac{4}{\sqrt{2\pi}}\,\dfrac{\sin^2\left(\frac{1}{2}ax\right)}{ax^2}, \quad a > 0$
    $\qquad\qquad \begin{cases} 1 - \frac{|\omega|}{a} & \text{if } |\omega| < a \\ 0 & \text{if } |\omega| > a \end{cases}$

12. $\dfrac{4}{\sqrt{2\pi}}\cdot\dfrac{\sin^2(ax) - \sin^2\left(\frac{1}{2}ax\right)}{ax^2}, \quad a > 0$
    $\qquad\qquad \begin{cases} 1 & \text{if } |x| < a \\ (-x + 2a)/a & \text{if } a < x < 2a \\ (x + 2a)/a & \text{if } a < x < 2a \\ 0 & \text{if } |x| > 2a \end{cases}$

13. $e^{-a|x|}, \quad a > 0$
    $\qquad\qquad \sqrt{\dfrac{2}{\pi}}\,\dfrac{a}{a^2 + \omega^2}$

14. $\begin{cases} e^{-ax} & \text{if } x > 0 \\ 0 & \text{if } x < 0 \end{cases}, \quad a > 0$
    $\qquad\qquad \dfrac{1}{\sqrt{2\pi}}\,\dfrac{1}{a + i\omega}$

15. $\begin{cases} 0 & \text{if } x > 0 \\ e^{ax} & \text{if } x < 0 \end{cases}, \quad a > 0$
    $\qquad\qquad \dfrac{1}{\sqrt{2\pi}}\,\dfrac{1}{a - i\omega}$

16. $|x|^n e^{-a|x|}, \quad a > 0, \ n > 0$
    $\qquad \dfrac{\Gamma(n+1)}{\sqrt{2\pi}}\left(\dfrac{1}{(a - i\omega)^{1+n}} + \dfrac{1}{(a + i\omega)^{1+n}}\right)$

Table of Fourier Transforms (continued)

$$f(x) = \frac{1}{\sqrt{2\pi}} \int_{-\infty}^{\infty} \widehat{f}(\omega)e^{ix\omega}\, d\omega \qquad\qquad \widehat{f}(\omega) = \mathcal{F}(f)(\omega) = \frac{1}{\sqrt{2\pi}} \int_{-\infty}^{\infty} f(x)e^{-i\omega x}\, dx$$

17.	$e^{-\frac{a}{2}x^2}$, $a > 0$	$\dfrac{1}{\sqrt{a}}e^{-\frac{\omega^2}{2a}}$
18.	e^{-ax^2}, $a > 0$	$\dfrac{1}{\sqrt{2a}}e^{-\frac{\omega^2}{4a}}$
19.	$xe^{-\frac{a}{2}x^2}$, $a > 0$	$\dfrac{-i\omega}{a^{3/2}}e^{-\frac{\omega^2}{2a}}$
20.	$x^2 e^{-\frac{a}{2}x^2}$, $a > 0$	$\dfrac{a - \omega^2}{a^{5/2}}e^{-\frac{\omega^2}{2a}}$
21.	$x^3 e^{-\frac{a}{2}x^2}$, $a > 0$	$\dfrac{-i\omega(3a - \omega^2)}{a^{7/2}}e^{-\frac{\omega^2}{2a}}$
22.	$e^{-\frac{x^2}{2}}H_n(x)$, H_n, nth Hermite polynomial	$(-1)^n i^n e^{\frac{-\omega^2}{2}}H_n(\omega)$
23.	$J_0(x)$, Bessel function of order 0	$\begin{cases} \sqrt{\dfrac{2}{\pi}}\dfrac{1}{\sqrt{1-\omega^2}} & \text{if } |\omega| < 1 \\ 0 & \text{if } |\omega| > 1 \end{cases}$
24.	$J_n(x)$, Bessel function of order $n \geq 0$	$\begin{cases} \sqrt{\dfrac{2}{\pi}}\dfrac{(-i)^n}{\sqrt{1-\omega^2}}T_n(\omega) & \text{if } |\omega| < 1 \\ 0 & \text{if } |\omega| > 1 \end{cases}$ T_n, Chebyshev polynomial of degree n.

Special Transforms

25.	$\mathcal{F}(\delta_0(x))(\omega) = \dfrac{1}{\sqrt{2\pi}}$	27.	$\mathcal{F}\left(\sqrt{\dfrac{2}{\pi}}\dfrac{1}{x}\right)(\omega) = -i\,\mathrm{sgn}\,\omega$
26	$\mathcal{F}(\delta_0(x - a))(\omega) = \dfrac{1}{\sqrt{2\pi}}e^{-ia\omega}$	28.	$\mathcal{F}(e^{iax})(\omega) = \sqrt{2\pi}\delta_0(\omega - a)$

Operational Properties

29.	$\mathcal{F}(af + bg)(\omega) = a\mathcal{F}(f) + b\mathcal{F}(g)$	36.	$\mathcal{F}(f\,g)(\omega) = \mathcal{F}(f) * \mathcal{F}(g)(\omega)$
30.	$\mathcal{F}(f')(\omega) = i\omega\mathcal{F}(f)(\omega)$	37.	$\mathcal{F}(f(x - a))(\omega) = e^{-ia\omega}\mathcal{F}(f)(\omega)$
31.	$\mathcal{F}(f'')(\omega) = -\omega^2\mathcal{F}(f)(\omega)$	38.	$\mathcal{F}(e^{iax}f(x))(\omega) = \mathcal{F}(f)(\omega - a)$
32.	$\mathcal{F}(f^{(n)})(\omega) = (i\omega)^n\mathcal{F}(f)(\omega)$	39.	$\mathcal{F}(\cos(ax)f(x))(\omega) = \dfrac{\mathcal{F}(f)(\omega-a)+\mathcal{F}(f)(\omega+a)}{2}$
33.	$\mathcal{F}(xf(x))(\omega) = i\dfrac{d}{d\omega}\mathcal{F}(f)(\omega)$	40.	$\mathcal{F}(\sin(ax)f(x))(\omega) = \dfrac{\mathcal{F}(f)(\omega-a)-\mathcal{F}(f)(\omega+a)}{2i}$
34.	$\mathcal{F}(x^n f(x))(\omega) = i^n\dfrac{d^n}{d\omega^n}\mathcal{F}(f)(\omega)$	41.	$\mathcal{F}(f(ax))(\omega) = \dfrac{1}{|a|}\mathcal{F}(f)(\frac{\omega}{a})$, $a \neq 0$
35.	$\mathcal{F}(f * g)(\omega) = \mathcal{F}(f)(\omega)\mathcal{F}(g)(\omega)$	42.	$f(x) = \mathcal{F}(\widehat{f})(-x)$, $\mathcal{F}(\mathcal{F}(f)) = f(-x)$

Table of Fourier Cosine Transforms

$f(x) = \sqrt{\dfrac{2}{\pi}} \displaystyle\int_0^\infty \mathcal{F}_c(f)(\omega) \cos \omega x \, d\omega,$ $0 < x < \infty$	$\mathcal{F}_c(f)(\omega) = \widehat{f}_c(\omega) = \sqrt{\dfrac{2}{\pi}} \displaystyle\int_0^\infty f(x) \cos \omega x \, dx,$ $0 \le \omega < \infty$
1. $\begin{cases} 1 & \text{if } 0 < x < a \\ 0 & \text{otherwise} \end{cases}$	$\sqrt{\dfrac{2}{\pi}} \dfrac{\sin a\omega}{\omega}$
2. $e^{-ax}, \quad a > 0$	$\sqrt{\dfrac{2}{\pi}} \dfrac{a}{a^2+\omega^2}$
3. $x e^{-ax}, \quad a > 0$	$\sqrt{\dfrac{2}{\pi}} \dfrac{a^2-\omega^2}{(a^2+\omega^2)^2}$
4. $e^{-a x^2/2}, \quad a > 0$	$\dfrac{1}{\sqrt{a}} e^{-\omega^2/2a}$
5. $\cos ax \, e^{-ax}, \quad a > 0$	$\sqrt{\dfrac{2}{\pi}} \dfrac{a\omega^2+2a^3}{4a^4+\omega^4}$
6. $\sin ax \, e^{-ax}, \quad a > 0$	$\sqrt{\dfrac{2}{\pi}} \dfrac{2a^3-a\omega^2}{4a^4+\omega^4}$
7. $\dfrac{a}{a^2+x^2}, \quad a > 0$	$\sqrt{\dfrac{\pi}{2}} e^{-a\omega}$
8. $x^p, \quad 0 < p < 1$	$\sqrt{\dfrac{2}{\pi}} \dfrac{\Gamma(p)\cos(p\omega/2)}{\omega^p}$
9. $\begin{cases} \cos x & \text{if } 0 < x < a \\ 0 & \text{otherwise} \end{cases}$	$\dfrac{1}{\sqrt{2\pi}} \left[\dfrac{\sin a(1-\omega)}{1-\omega} + \dfrac{\sin a(1+\omega)}{1+\omega} \right]$

Operational Properties

10. $\alpha f(x) + \beta g(x)$	$\alpha \mathcal{F}_c(f)(\omega) + \beta \mathcal{F}_c(g)(\omega)$
11. $f(ax), \quad a > 0$	$\dfrac{1}{a} \widehat{f}_c\!\left(\dfrac{\omega}{a}\right)$
12. $f'(x)$	$\omega \widehat{f}_s(\omega) - \sqrt{\dfrac{2}{\pi}} f(0)$
13. $f''(x)$	$-\omega^2 \widehat{f}_c(\omega) - \sqrt{\dfrac{2}{\pi}} f'(0)$
14. $x f(x)$	$\left[\widehat{f}_s\right]'(\omega)$
15. $\mathcal{F}_c(\mathcal{F}_c f)$	f

Table of Fourier Sine Transforms

$$f(x) = \sqrt{\frac{2}{\pi}} \int_0^\infty \mathcal{F}_s(f)(\omega) \sin \omega x \, d\omega,$$

$$\mathcal{F}_s(f)(\omega) = \widehat{f}_s(\omega) = \sqrt{\frac{2}{\pi}} \int_0^\infty f(x) \sin \omega x \, dx,$$

$$0 < x < \infty$$

$$0 < \omega < \infty$$

1.	$\begin{cases} 1 & \text{if } 0 < x < a \\ 0 & \text{otherwise} \end{cases}$	$\sqrt{\frac{2}{\pi}} \frac{1 - \cos a\omega}{\omega}$
2.	$e^{-ax}, \quad a > 0$	$\sqrt{\frac{2}{\pi}} \frac{\omega}{a^2 + \omega^2}$
3.	$x e^{-ax}, \quad a > 0$	$\sqrt{\frac{2}{\pi}} \frac{2a\omega}{(a^2 + \omega^2)^2}$
4.	$\frac{e^{-ax}}{x}, \quad a > 0$	$\sqrt{\frac{2}{\pi}} \tan^{-1} \frac{\omega}{a}$
5.	$\frac{1}{2} x e^{-a x^2}, \quad a > 0$	$\frac{\omega}{a^{3/2}} e^{-\omega^2 / 2a}$
6.	$\cos ax \, e^{-ax}, \quad a > 0$	$\sqrt{\frac{2}{\pi}} \frac{\omega^3}{4a^4 + \omega^4}$
7.	$\sin ax \, e^{-ax}, \quad a > 0$	$\sqrt{\frac{2}{\pi}} \frac{2a^2 \omega}{4a^4 + \omega^4}$
8.	$\frac{x}{a^2 + x^2}, \quad a > 0$	$\sqrt{\frac{\pi}{2}} e^{-a\omega}$
9.	$x^{p-1}, \quad 0 < p < 1$	$\sqrt{\frac{2}{\pi}} \frac{\Gamma(p) \cos(\pi p / 2)}{\omega^p}$
10.	$\begin{cases} \sin x & \text{if } 0 < x < a \\ 0 & \text{otherwise} \end{cases}$	$\frac{1}{\sqrt{2\pi}} \left[\frac{\sin a(1 - \omega)}{1 - \omega} - \frac{\sin a(1 + \omega)}{1 + \omega} \right]$

Operational Properties

11.	$\alpha f(x) + \beta g(x)$	$\alpha \mathcal{F}_s(f)(\omega) + \beta \mathcal{F}_s(g)(\omega)$
12.	$f(ax), \quad a > 0$	$\frac{1}{a} \widehat{f}_s \left(\frac{\omega}{a} \right)$
13.	$f'(x)$	$-\omega \widehat{f}_c(\omega)$
14.	$f''(x)$	$-\omega^2 \widehat{f}_s(\omega) + \sqrt{\frac{2}{\pi}} \omega f(0)$
15.	$x f(x)$	$-\left[\widehat{f}_c \right]'(\omega)$
16.	$\mathcal{F}_s(\mathcal{F}_s f)$	f

Table of Laplace Transforms

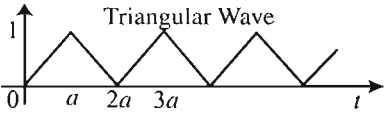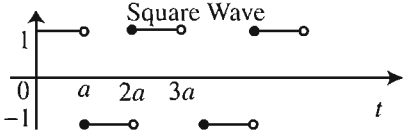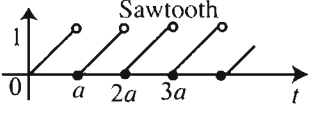| $f(t), \quad t \geq 0$	$F(s) = \mathcal{L}(f)(s) = \int_0^\infty f(t)e^{-st}\, dt,$
1. 1	$\frac{1}{s}, \quad s > 0$
2. $t^n, \quad n = 1, 2, \ldots$	$\frac{n!}{s^{n+1}}, \quad s > 0$
3. $t^a \quad (a > -1)$	$\frac{\Gamma(a+1)}{s^{a+1}}, \quad s > 0$
4. e^{at}	$\frac{1}{s-a}, \quad s > a$
5. $t^n e^{at}$	$\frac{n!}{(s-a)^{n+1}}, \quad s > a$
6. $\frac{e^{at} - e^{bt}}{a-b}$	$\frac{1}{(s-a)(s-b)}, \quad s > \max(a, b)$
7. $\frac{ae^{at} - be^{bt}}{a-b}$	$\frac{s}{(s-a)(s-b)}, \quad s > \max(a, b)$
8. $\sin kt$	$\frac{k}{s^2 + k^2}, \quad s > 0$
9. $\cos kt$	$\frac{s}{s^2 + k^2}, \quad s > 0$
10. $e^{at} \sin kt$	$\frac{k}{(s-a)^2 + k^2}, \quad s > a$
11. $e^{at} \cos kt$	$\frac{s-a}{(s-a)^2 + k^2}, \quad s > a$
12. $t \sin kt$	$\frac{2ks}{(s^2 + k^2)^2}, \quad s > 0$
13. $t \cos kt$	$\frac{s^2 - k^2}{(s^2 + k^2)^2}, \quad s > 0$
14. $\frac{1}{2a^3}(\sin at - at \cos at)$	$\frac{1}{(s^2 + a^2)^2}, \quad s > 0$
15. $\sinh kt$	$\frac{k}{s^2 - k^2}, \quad s > |k|$
16. $\cosh kt$	$\frac{s}{s^2 - k^2}, \quad s > |k|$
17. $e^{at} \sinh kt$	$\frac{k}{(s-a)^2 - k^2} \quad s > a + |k|$
18. $e^{at} \cosh kt$	$\frac{s-a}{(s-a)^2 - k^2} \quad s > a + |k|$
19. $t \sinh kt$	$\frac{2ks}{(s^2 - k^2)^2}, \quad s > |k|$
20. $t \cosh kt$	$\frac{s^2 + k^2}{(s^2 - k^2)^2}, \quad s > |k|$
21. $\frac{1}{2k^3}(kt \cosh kt - \sinh kt)$	$\frac{1}{(s^2 - k^2)^2}, \quad s > |k|$

Table of Laplace Transforms (continued)

$f(t), \quad t \geq 0$	$F(s) = \mathcal{L}(f)(s) = \displaystyle\int_0^\infty f(t)e^{-st}\,dt,$

22. $\delta_0(t - t_0), \quad t_0 \geq 0$ $\qquad\qquad$ $e^{-t_0 s}, \quad s > 0$

23. $\mathcal{U}_0(t - a) = \begin{cases} 0 & \text{if } t < a \\ 1 & \text{if } t \geq a \end{cases} \quad (a > 0)$ $\qquad$ $\dfrac{e^{-as}}{s}, \quad s > 0$

24. $f(t + T) = f(t) \quad (T > 0)$ $\qquad\qquad$ $\dfrac{1}{1 - e^{-Ts}} \displaystyle\int_0^T e^{-st} f(t)\,dt$

25. $f(t + T) = -f(t) \quad (T > 0)$ $\qquad\qquad$ $\dfrac{1}{1 + e^{-Ts}} \displaystyle\int_0^T e^{-st} f(t)\,dt$

26.

Triangular Wave

$\dfrac{1}{as^2}\left[\dfrac{1 - e^{-as}}{1 + e^{-as}}\right] = \dfrac{1}{as^2}\tanh\left(\dfrac{as}{2}\right), \quad s > 0$

27.

Square Wave

$\dfrac{1}{s}\left[\dfrac{1 - e^{-as}}{1 + e^{-as}}\right] = \dfrac{1}{s}\tanh\left(\dfrac{as}{2}\right), \quad s > 0$

28.

Sawtooth

$\dfrac{1}{as^2} - \dfrac{e^{-as}}{s(1 - e^{-as})}, \quad s > 0$

29. $\dfrac{\sin at}{t}$ $\qquad\qquad$ $\tan^{-1}\left(\dfrac{a}{s}\right), \quad s > 0$

30. $J_0(at)$ $\qquad\qquad$ $\dfrac{1}{\sqrt{s^2 + a^2}}, \quad s > 0$

31. $J_0(a\sqrt{t})$ $\qquad\qquad$ $\dfrac{e^{-a^2/4s}}{s}, \quad s > 0$

32. $t^p J_p(at) \quad \left(p > -\dfrac{1}{2}\right)$ $\qquad$ $\dfrac{2^p a^p \Gamma\left(p + \frac{1}{2}\right)}{\sqrt{\pi}(s^2 + a^2)^{p + \frac{1}{2}}}, \quad s > 0$

33. $\dfrac{\sqrt{\pi}}{\Gamma(k)}\left(\dfrac{t}{2a}\right)^{k - \frac{1}{2}} J_{k - \frac{1}{2}}(at) \quad (k > 0)$ $\qquad$ $\dfrac{1}{(s^2 + a^2)^k}, \quad s > 0$

34. $\dfrac{\sqrt{\pi}}{\Gamma(k)} a \left(\dfrac{t}{2a}\right)^{k - \frac{1}{2}} J_{k - \frac{3}{2}}(at) \quad \left(k > \dfrac{1}{2}\right)$ $\qquad$ $\dfrac{s}{(s^2 + a^2)^k}, \quad s > 0$

35. $2\displaystyle\sum_{m=1}^{n} \binom{2n - m - 1}{n - 1} \dfrac{t^{m-1}\cos\left(at - \frac{m\pi}{2}\right)}{(2a)^{2n - m}(m - 1)!}$ $\qquad$ $\dfrac{1}{(s^2 + a^2)^n}, \quad s > 0$

$(n \text{ an integer } \geq 1)$

36. $\dfrac{1}{(n - 1)!}\displaystyle\sum_{m=1}^{n-1} \dfrac{(2n - m - 3)!}{(m - 1)!(n - m - 1)!} \dfrac{t^m \cos\left(at - \frac{m\pi}{2}\right)}{(2a)^{2n - m - 2}}$ $\qquad$ $\dfrac{s}{(s^2 + a^2)^n}, \quad s > 0$

$(n \text{ an integer } \geq 2)$

Table of Laplace Transforms (continued)

$f(t), \quad t \geq 0$	$F(s) = \mathcal{L}(f)(s) = \displaystyle\int_0^\infty f(t)e^{-st}\,dt,$
37. $\operatorname{erf}(at) \quad (a > 0)$	$\frac{1}{s}e^{s^2/4a^2}\operatorname{erfc}\left(\frac{s}{2a}\right), \quad s > 0$
38. $\operatorname{erf}(a\sqrt{t})$	$\frac{a}{s\sqrt{s+a^2}}, \quad s > 0$
39. $e^{-a^2 t^2} \quad (a > 0)$	$\frac{\sqrt{\pi}}{2a}e^{s^2/4a^2}\operatorname{erfc}\left(\frac{s}{2a}\right), \quad s > 0$
40. $\frac{1}{\sqrt{\pi t}}e^{-a^2/4t} \quad (a \geq 0)$	$\frac{e^{-a\sqrt{s}}}{\sqrt{s}}, \quad s > 0$
41. $\frac{a}{2\sqrt{\pi}t^{3/2}}e^{-a^2/4t} \quad (a > 0)$	$e^{-a\sqrt{s}}, \quad s > 0$
42. $\operatorname{erfc}\left(\frac{a}{2\sqrt{t}}\right) \quad (a \geq 0)$	$\frac{1}{s}e^{-a\sqrt{s}}, \quad s > 0$

Operational Properties

43. $\alpha f(t) + \beta g(t)$	$\alpha F(s) + \beta G(s)$
44. $f'(t)$	$sF(s) - f(0)$
45. $f''(t)$	$s^2 F(s) - sf(0) - f'(0)$
46. $f^{(n)}(t)$	$s^n F(s) - s^{n-1}f(0) - \ldots - f^{(n-1)}(0)$
47. $-tf(t)$	$F'(s)$
48. $t^n f(t)$	$(-1)^n F^{(n)}(s)$
49. $\int_0^t f(\tau)\,d\tau$	$\frac{1}{s}F(s), \quad s > 0$
50. $\int_0^t \int_0^\tau f(\rho)\,d\rho d\tau$	$\frac{1}{s^2}F(s), \quad s > 0$
51. $\frac{f(t)}{t}$	$\displaystyle\int_s^\infty F(u)\,du$
52. $\frac{f(t)}{t^2}$	$\displaystyle\int_s^\infty \int_\sigma^\infty F(u)\,du d\sigma$
53. $\mathcal{U}(t-a)f(t-a) \quad (a > 0)$	$e^{-as}F(s)$
54. $e^{at}f(t)$	$F(s-a)$
55. $f(ct) \quad (c > 0)$	$\frac{1}{c}F\left(\frac{s}{c}\right)$
56. $f * g(t) = \displaystyle\int_0^t f(\tau)g(t-\tau)\,d\tau$	$F(s)G(s)$