

TABLE OF GENERAL PROPERTIES OF LAPLACE TRANSFORMS

	$f(s)$	$F(t)$
32.3	$a f_1(s) + b f_2(s)$	$a F_1(t) + b F_2(t)$
32.4	$f(s/a)$	$a F(at)$
32.5	$f(s - a)$	$e^{at} F(t)$
32.6	$e^{-as} f(s)$	$U(t-a) = \begin{cases} F(t-a) & t > a \\ 0 & t < a \end{cases}$
32.7	$s f(s) - F(0)$	$F'(t)$
32.8	$s^2 f(s) - s F(0) - F'(0)$	$F''(t)$
32.9	$s^n f(s) - s^{n-1} F(0) - s^{n-2} F'(0) - \dots - F^{(n-1)}(0)$	$F^{(n)}(t)$
32.10	$f'(s)$	$-t F(t)$
32.11	$f''(s)$	$t^2 F(t)$
32.12	$f^{(n)}(s)$	$(-1)^n t^n F(t)$
32.13	$\frac{f(s)}{s}$	$\int_0^t F(u) du$
32.14	$\frac{f(s)}{s^n}$	$\int_0^t \dots \int_0^t F(u) du^n = \int_0^t \frac{(t-u)^{n-1}}{(n-1)!} F(u) du$
32.15	$f(s) g(s)$	$\int_0^t F(u) G(t-u) du$

	$f(s)$	$F(t)$
32.16	$\int_s^\infty f(u) du$	$\frac{F(t)}{t}$
32.17	$\frac{1}{1 - e^{-sT}} \int_0^T e^{-su} F(u) du$	$F(t) = F(t+T)$
32.18	$\frac{f(\sqrt{s})}{s}$	$\frac{1}{\sqrt{\pi t}} \int_0^\infty e^{-u^2/4t} F(u) du$
32.19	$\frac{1}{s} f(1/s)$	$\int_0^\infty J_0(2\sqrt{ut}) F(u) du$
32.20	$\frac{1}{s^{n+1}} f(1/s)$	$t^{n/2} \int_0^\infty u^{-n/2} J_n(2\sqrt{ut}) F(u) du$
32.21	$\frac{f(s+1/s)}{s^2+1}$	$\int_0^t J_0(2\sqrt{u(t-u)}) F(u) du$
32.22	$\frac{1}{2\sqrt{\pi}} \int_0^\infty u^{-3/2} e^{-s^2/4u} f(u) du$	$F(t^2)$
32.23	$\frac{f(\ln s)}{s \ln s}$	$\int_0^\infty \frac{t^u F(u)}{\Gamma(u+1)} du$
32.24	$\frac{P(s)}{Q(s)}$	$\sum_{k=1}^n \frac{P(\alpha_k)}{Q'(\alpha_k)} e^{\alpha_k t}$

$P(s)$ = polynomial of degree less than n ,
 $Q(s) = (s - \alpha_1)(s - \alpha_2) \dots (s - \alpha_n)$
where $\alpha_1, \alpha_2, \dots, \alpha_n$ are all distinct.

TABLE OF SPECIAL LAPLACE TRANSFORMS

	$f(s)$	$F(t)$
32.25	$\frac{1}{s}$	1
32.26	$\frac{1}{s^2}$	t
32.27	$\frac{1}{s^n} \quad n = 1, 2, 3, \dots$	$\frac{t^{n-1}}{(n-1)!}, \quad 0! = 1$
32.28	$\frac{1}{s^n} \quad n > 0$	$\frac{t^{n-1}}{\Gamma(n)}$
32.29	$\frac{1}{s-a}$	e^{at}
32.30	$\frac{1}{(s-a)^n} \quad n = 1, 2, 3, \dots$	$\frac{t^{n-1} e^{at}}{(n-1)!}, \quad 0! = 1$
32.31	$\frac{1}{(s-a)^n} \quad n > 0$	$\frac{t^{n-1} e^{at}}{\Gamma(n)}$
32.32	$\frac{1}{s^2 + a^2}$	$\frac{\sin at}{a}$
32.33	$\frac{s}{s^2 + a^2}$	$\cos at$
32.34	$\frac{1}{(s-b)^2 + a^2}$	$\frac{e^{bt} \sin at}{a}$
32.35	$\frac{s-b}{(s-b)^2 + a^2}$	$e^{bt} \cos at$
32.36	$\frac{1}{s^2 - a^2}$	$\frac{\sinh at}{a}$
32.37	$\frac{s}{s^2 - a^2}$	$\cosh at$
32.38	$\frac{1}{(s-b)^2 - a^2}$	$\frac{e^{bt} \sinh at}{a}$

	$f(s)$	$F(t)$
32.39	$\frac{s-b}{(s-b)^2 - a^2}$	$e^{bt} \cosh at$
32.40	$\frac{1}{(s-a)(s-b)} \quad a \neq b$	$\frac{e^{bt} - e^{at}}{b-a}$
32.41	$\frac{s}{(s-a)(s-b)} \quad a \neq b$	$\frac{be^{bt} - ae^{at}}{b-a}$
32.42	$\frac{1}{(s^2 + a^2)^2}$	$\frac{\sin at - at \cos at}{2a^3}$
32.43	$\frac{s}{(s^2 + a^2)^2}$	$\frac{t \sin at}{2a}$
32.44	$\frac{s^2}{(s^2 + a^2)^2}$	$\frac{\sin at + at \cos at}{2a}$
32.45	$\frac{s^3}{(s^2 + a^2)^2}$	$\cos at - \frac{1}{2} at \sin at$
32.46	$\frac{s^2 - a^2}{(s^2 + a^2)^2}$	$t \cos at$
32.47	$\frac{1}{(s^2 - a^2)^2}$	$\frac{at \cosh at - \sinh at}{2a^3}$
32.48	$\frac{s}{(s^2 - a^2)^2}$	$\frac{t \sinh at}{2a}$
32.49	$\frac{s^2}{(s^2 - a^2)^2}$	$\frac{\sinh at + at \cosh at}{2a}$
32.50	$\frac{s^3}{(s^2 - a^2)^2}$	$\cosh at + \frac{1}{2} at \sinh at$
32.51	$\frac{s^2 + a^2}{(s^2 - a^2)^2}$	$t \cosh at$
32.52	$\frac{1}{(s^2 + a^2)^3}$	$\frac{(3 - a^2 t^2) \sin at - 3at \cos at}{8a^5}$
32.53	$\frac{s}{(s^2 + a^2)^3}$	$\frac{t \sin at - at^2 \cos at}{8a^3}$
32.54	$\frac{s^2}{(s^2 + a^2)^3}$	$\frac{(1 + a^2 t^2) \sin at - at \cos at}{8a^3}$
32.55	$\frac{s^3}{(s^2 + a^2)^3}$	$\frac{3t \sin at + at^2 \cos at}{8a}$

	$f(s)$	$F(t)$
32.56	$\frac{s^4}{(s^2 + a^2)^3}$	$\frac{(3 - a^2 t^2) \sin at + 5at \cos at}{8a}$
32.57	$\frac{s^5}{(s^2 + a^2)^3}$	$\frac{(8 - a^2 t^2) \cos at - 7at \sin at}{8}$
32.58	$\frac{3s^2 - a^2}{(s^2 + a^2)^3}$	$\frac{t^2 \sin at}{2a}$
32.59	$\frac{s^3 - 3a^2 s}{(s^2 + a^2)^3}$	$\frac{1}{2} t^2 \cos at$
32.60	$\frac{s^4 - 6a^2 s^2 + a^4}{(s^2 + a^2)^4}$	$\frac{1}{6} t^3 \cos at$
32.61	$\frac{s^3 - a^2 s}{(s^2 + a^2)^4}$	$\frac{t^3 \sin at}{24a}$
32.62	$\frac{1}{(s^2 - a^2)^3}$	$\frac{(3 + a^2 t^2) \sinh at - 3at \cosh at}{8a^5}$
32.63	$\frac{s}{(s^2 - a^2)^3}$	$\frac{at^2 \cosh at - t \sinh at}{8a^3}$
32.64	$\frac{s^2}{(s^2 - a^2)^3}$	$\frac{at \cosh at + (a^2 t^2 - 1) \sinh at}{8a^3}$
32.65	$\frac{s^3}{(s^2 - a^2)^3}$	$\frac{3t \sinh at + at^2 \cosh at}{8a}$
32.66	$\frac{s^4}{(s^2 - a^2)^3}$	$\frac{(3 + a^2 t^2) \sinh at + 5at \cosh at}{8a}$
32.67	$\frac{s^5}{(s^2 - a^2)^3}$	$\frac{(8 + a^2 t^2) \cosh at + 7at \sinh at}{8}$
32.68	$\frac{3s^2 + a^2}{(s^2 - a^2)^3}$	$\frac{t^2 \sinh at}{2a}$
32.69	$\frac{s^3 + 3a^2 s}{(s^2 - a^2)^3}$	$\frac{1}{2} t^2 \cosh at$
32.70	$\frac{s^4 + 6a^2 s^2 + a^4}{(s^2 - a^2)^4}$	$\frac{1}{6} t^3 \cosh at$
32.71	$\frac{s^3 + a^2 s}{(s^2 - a^2)^4}$	$\frac{t^3 \sinh at}{24a}$
32.72	$\frac{1}{s^3 + a^3}$	$\frac{eat/2}{3a^2} \left\{ \sqrt{3} \sin \frac{\sqrt{3} at}{2} - \cos \frac{\sqrt{3} at}{2} + e^{-3at/2} \right\}$

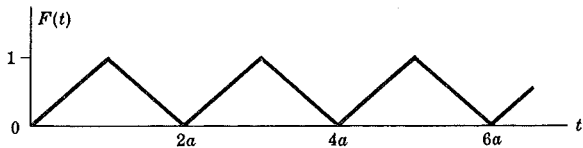
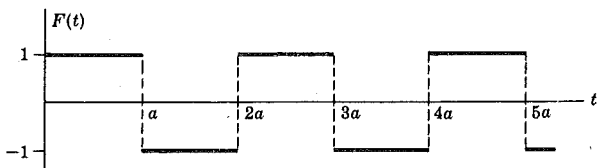
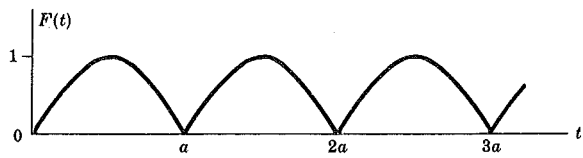
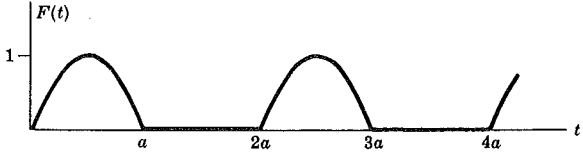
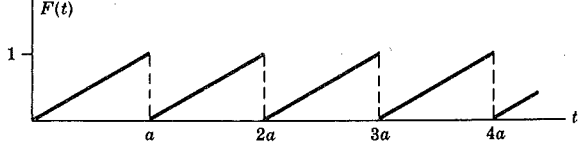
	$f(s)$	$F(t)$
32.73	$\frac{s}{s^3 + a^3}$	$\frac{eat/2}{3a} \left\{ \cos \frac{\sqrt{3} at}{2} + \sqrt{3} \sin \frac{\sqrt{3} at}{2} - e^{-3at/2} \right\}$
32.74	$\frac{s^2}{s^3 + a^3}$	$\frac{1}{3} \left(e^{-at} + 2e^{at/2} \cos \frac{\sqrt{3} at}{2} \right)$
32.75	$\frac{1}{s^3 - a^3}$	$\frac{e^{-at/2}}{3a^2} \left\{ e^{3at/2} - \cos \frac{\sqrt{3} at}{2} - \sqrt{3} \sin \frac{\sqrt{3} at}{2} \right\}$
32.76	$\frac{s}{s^3 - a^3}$	$\frac{e^{-at/2}}{3a} \left\{ \sqrt{3} \sin \frac{\sqrt{3} at}{2} - \cos \frac{\sqrt{3} at}{2} + e^{3at/2} \right\}$
32.77	$\frac{s^2}{s^3 - a^3}$	$\frac{1}{3} \left(e^{at} + 2e^{-at/2} \cos \frac{\sqrt{3} at}{2} \right)$
32.78	$\frac{1}{s^4 + 4a^4}$	$\frac{1}{4a^3} (\sin at \cosh at - \cos at \sinh at)$
32.79	$\frac{s}{s^4 + 4a^4}$	$\frac{\sin at \sinh at}{2a^2}$
32.80	$\frac{s^2}{s^4 + 4a^4}$	$\frac{1}{2a} (\sin at \cosh at + \cos at \sinh at)$
32.81	$\frac{s^3}{s^4 + 4a^4}$	$\cos at \cosh at$
32.82	$\frac{1}{s^4 - a^4}$	$\frac{1}{2a^3} (\sinh at - \sin at)$
32.83	$\frac{s}{s^4 - a^4}$	$\frac{1}{2a^2} (\cosh at - \cos at)$
32.84	$\frac{s^2}{s^4 - a^4}$	$\frac{1}{2a} (\sinh at + \sin at)$
32.85	$\frac{s^3}{s^4 - a^4}$	$\frac{1}{2} (\cosh at + \cos at)$
32.86	$\frac{1}{\sqrt{s+a} + \sqrt{s+b}}$	$\frac{e^{-bt} - e^{-at}}{2(b-a)\sqrt{\pi t^3}}$
32.87	$\frac{1}{s\sqrt{s+a}}$	$\frac{\operatorname{erf} \sqrt{at}}{\sqrt{a}}$
32.88	$\frac{1}{\sqrt{s(s-a)}}$	$\frac{eat \operatorname{erf} \sqrt{at}}{\sqrt{a}}$
32.89	$\frac{1}{\sqrt{s-a+b}}$	$eat \left\{ \frac{1}{\sqrt{\pi t}} - b e^{b^2 t} \operatorname{erfc}(b\sqrt{t}) \right\}$

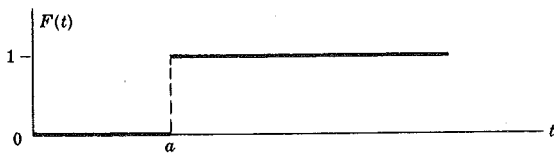
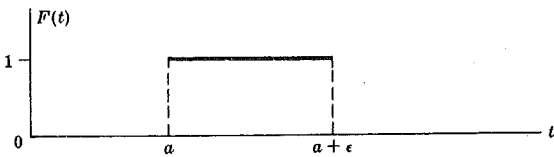
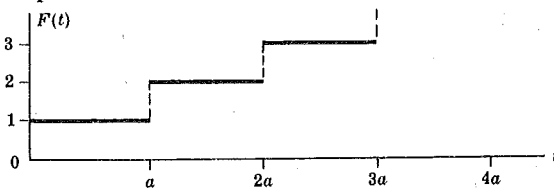
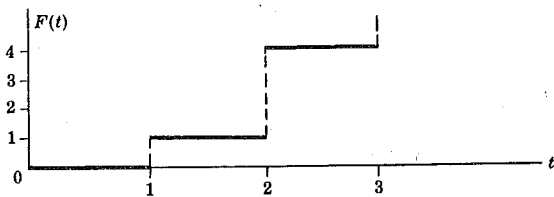
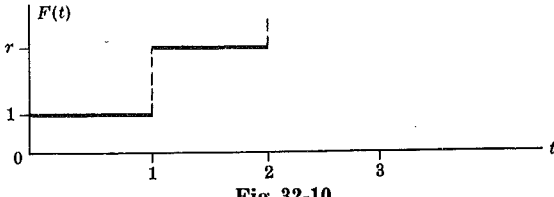
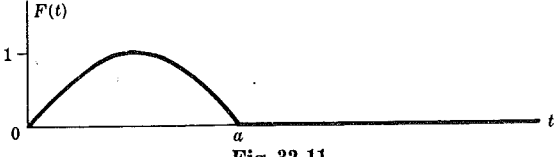
	$f(s)$	$F(t)$
32.90	$\frac{1}{\sqrt{s^2 + a^2}}$	$J_0(at)$
32.91	$\frac{1}{\sqrt{s^2 - a^2}}$	$I_0(at)$
32.92	$\frac{(\sqrt{s^2 + a^2} - s)^n}{\sqrt{s^2 + a^2}} \quad n > -1$	$a^n J_n(at)$
32.93	$\frac{(s - \sqrt{s^2 - a^2})^n}{\sqrt{s^2 - a^2}} \quad n > -1$	$a^n I_n(at)$
32.94	$\frac{e^{b(s - \sqrt{s^2 + a^2})}}{\sqrt{s^2 + a^2}}$	$J_0(a\sqrt{t(t + 2b)})$
32.95	$\frac{e^{-b\sqrt{s^2 + a^2}}}{\sqrt{s^2 + a^2}}$	$\begin{cases} J_0(a\sqrt{t^2 - b^2}) & t > b \\ 0 & t < b \end{cases}$
32.96	$\frac{1}{(s^2 + a^2)^{3/2}}$	$\frac{tJ_1(at)}{a}$
32.97	$\frac{s}{(s^2 + a^2)^{3/2}}$	$tJ_0(at)$
32.98	$\frac{s^2}{(s^2 + a^2)^{3/2}}$	$J_0(at) - atJ_1(at)$
32.99	$\frac{1}{(s^2 - a^2)^{3/2}}$	$\frac{tI_1(at)}{a}$
32.100	$\frac{s}{(s^2 - a^2)^{3/2}}$	$tI_0(at)$
32.101	$\frac{s^2}{(s^2 - a^2)^{3/2}}$	$I_0(at) + atI_1(at)$
32.102	$\frac{1}{s(e^s - 1)} = \frac{e^{-s}}{s(1 - e^{-s})}$ See also entry 32.165.	$F(t) = n, \quad n \leq t < n+1, \quad n = 0, 1, 2, \dots$
32.103	$\frac{1}{s(e^s - r)} = \frac{e^{-s}}{s(1 - re^{-s})}$	$F(t) = \sum_{k=1}^{[t]} r^k$ where $[t]$ = greatest integer $\leq t$
32.104	$\frac{e^s - 1}{s(e^s - r)} = \frac{1 - e^{-s}}{s(1 - re^{-s})}$ See also entry 32.167.	$F(t) = r^n, \quad n \leq t < n+1, \quad n = 0, 1, 2, \dots$
32.105	$\frac{e^{-a/s}}{\sqrt{s}}$	$\frac{\cos 2\sqrt{at}}{\sqrt{\pi t}}$

	$f(s)$	$F(t)$
32.106	$\frac{e^{-a/s}}{s^{3/2}}$	$\frac{\sin 2\sqrt{at}}{\sqrt{\pi a}}$
32.107	$\frac{e^{-a/s}}{s^{n+1}} \quad n > -1$	$\left(\frac{t}{a}\right)^{n/2} J_n(2\sqrt{at})$
32.108	$\frac{e^{-a\sqrt{s}}}{\sqrt{s}}$	$\frac{e^{-a^2/4t}}{\sqrt{\pi t}}$
32.109	$e^{-a\sqrt{s}}$	$\frac{a}{2\sqrt{\pi t^3}} e^{-a^2/4t}$
32.110	$\frac{1 - e^{-a\sqrt{s}}}{s}$	$\operatorname{erf}(a/2\sqrt{t})$
32.111	$\frac{e^{-a\sqrt{s}}}{s}$	$\operatorname{erfc}(a/2\sqrt{t})$
32.112	$\frac{e^{-a\sqrt{s}}}{\sqrt{s}(\sqrt{s+b})}$	$e^{b(bt+a)} \operatorname{erfc}\left(b\sqrt{t} + \frac{a}{2\sqrt{t}}\right)$
32.113	$\frac{e^{-a/\sqrt{s}}}{s^{n+1}} \quad n > -1$	$\frac{1}{\sqrt{\pi t} a^{2n+1}} \int_0^\infty u^n e^{-u^2/4a^2 t} J_{2n}(2\sqrt{u}) du$
32.114	$\ln\left(\frac{s+a}{s+b}\right)$	$\frac{e^{-bt} - e^{-at}}{t}$
32.115	$\frac{\ln[(s^2 + a^2)/a^2]}{2s}$	$\operatorname{Ci}(at)$
32.116	$\frac{\ln[(s+a)/a]}{s}$	$\operatorname{Ei}(at)$
32.117	$-\frac{(\gamma + \ln s)}{s}$ $\gamma = \text{Euler's constant} = .5772156\dots$	$\ln t$
32.118	$\ln\left(\frac{s^2 + a^2}{s^2 + b^2}\right)$	$\frac{2(\cos at - \cos bt)}{t}$
32.119	$\frac{\pi^2}{6s} + \frac{(\gamma + \ln s)^2}{s}$ $\gamma = \text{Euler's constant} = .5772156\dots$	$\ln^2 t$
32.120	$\frac{\ln s}{s}$	$-(\ln t + \gamma)$ $\gamma = \text{Euler's constant} = .5772156\dots$
32.121	$\frac{\ln^2 s}{s}$	$(\ln t + \gamma)^2 - \frac{1}{6}\pi^2$ $\gamma = \text{Euler's constant} = .5772156\dots$

	$f(s)$	$F(t)$
32.122	$\frac{\Gamma'(n+1) - \Gamma(n+1) \ln s}{s^{n+1}} \quad n > -1$	$t^n \ln t$
32.123	$\tan^{-1}(a/s)$	$\frac{\sin at}{t}$
32.124	$\frac{\tan^{-1}(a/s)}{s}$	$Si(at)$
32.125	$\frac{e^{a/s}}{\sqrt{s}} \operatorname{erfc}(\sqrt{a/s})$	$\frac{e^{-2\sqrt{at}}}{\sqrt{\pi t}}$
32.126	$e^{s^2/4a^2} \operatorname{erfc}(s/2a)$	$\frac{2a}{\sqrt{\pi}} e^{-a^2 t^2}$
32.127	$\frac{e^{s^2/4a^2} \operatorname{erfc}(s/2a)}{s}$	$\operatorname{erf}(at)$
32.128	$\frac{e^{as} \operatorname{erfc} \sqrt{as}}{\sqrt{s}}$	$\frac{1}{\sqrt{\pi(t+a)}}$
32.129	$e^{as} Ei(as)$	$\frac{1}{t+a}$
32.130	$\frac{1}{a} \left[\cos as \left\{ \frac{\pi}{2} - Si(as) \right\} - \sin as Ci(as) \right]$	$\frac{1}{t^2 + a^2}$
32.131	$\sin as \left\{ \frac{\pi}{2} - Si(as) \right\} + \cos as Ci(as)$	$\frac{t}{t^2 + a^2}$
32.132	$\frac{\cos as \left\{ \frac{\pi}{2} - Si(as) \right\} - \sin as Ci(as)}{s}$	$\tan^{-1}(t/a)$
32.133	$\frac{\sin as \left\{ \frac{\pi}{2} - Si(as) \right\} + \cos as Ci(as)}{s}$	$\frac{1}{2} \ln \left(\frac{t^2 + a^2}{a^2} \right)$
32.134	$\left[\frac{\pi}{2} - Si(as) \right]^2 + Ci^2(as)$	$\frac{1}{t} \ln \left(\frac{t^2 + a^2}{a^2} \right)$
32.135	0	$\mathcal{N}(t) = \text{null function}$
32.136	1	$\delta(t) = \text{delta function}$
32.137	e^{-as}	$\delta(t-a)$
32.138	$\frac{e^{-as}}{s}$ See also entry 32.163.	$\mathcal{U}(t-a)$

	$f(s)$	$F(t)$
32.139	$\frac{\sinh sx}{s \sinh sa}$	$\frac{x}{a} + \frac{2}{\pi} \sum_{n=1}^{\infty} \frac{(-1)^n}{n} \sin \frac{n\pi x}{a} \cos \frac{n\pi t}{a}$
32.140	$\frac{\sinh sx}{s \cosh sa}$	$\frac{4}{\pi} \sum_{n=1}^{\infty} \frac{(-1)^n}{2n-1} \sin \frac{(2n-1)\pi x}{2a} \sin \frac{(2n-1)\pi t}{2a}$
32.141	$\frac{\cosh sx}{s \sinh as}$	$\frac{t}{a} + \frac{2}{\pi} \sum_{n=1}^{\infty} \frac{(-1)^n}{n} \cos \frac{n\pi x}{a} \sin \frac{n\pi t}{a}$
32.142	$\frac{\cosh sx}{s \cosh sa}$	$1 + \frac{4}{\pi} \sum_{n=1}^{\infty} \frac{(-1)^n}{2n-1} \cos \frac{(2n-1)\pi x}{2a} \cos \frac{(2n-1)\pi t}{2a}$
32.143	$\frac{\sinh sx}{s^2 \sinh sa}$	$\frac{xt}{a} + \frac{2a}{\pi^2} \sum_{n=1}^{\infty} \frac{(-1)^n}{n^2} \sin \frac{n\pi x}{a} \sin \frac{n\pi t}{a}$
32.144	$\frac{\sinh sx}{s^2 \cosh sa}$	$x + \frac{8a}{\pi^2} \sum_{n=1}^{\infty} \frac{(-1)^n}{(2n-1)^2} \sin \frac{(2n-1)\pi x}{2a} \cos \frac{(2n-1)\pi t}{2a}$
32.145	$\frac{\cosh sx}{s^2 \sinh sa}$	$\frac{t^2}{2a} + \frac{2a}{\pi^2} \sum_{n=1}^{\infty} \frac{(-1)^n}{n^2} \cos \frac{n\pi x}{a} \left(1 - \cos \frac{n\pi t}{a} \right)$
32.146	$\frac{\cosh sx}{s^2 \cosh sa}$	$t + \frac{8a}{\pi^2} \sum_{n=1}^{\infty} \frac{(-1)^n}{(2n-1)^2} \cos \frac{(2n-1)\pi x}{2a} \sin \frac{(2n-1)\pi t}{2a}$
32.147	$\frac{\cosh sx}{s^3 \cosh sa}$	$\frac{1}{2}(t^2 + x^2 - a^2) - \frac{16a^2}{\pi^3} \sum_{n=1}^{\infty} \frac{(-1)^n}{(2n-1)^3} \cos \frac{(2n-1)\pi x}{2a} \cos \frac{(2n-1)\pi t}{2a}$
32.148	$\frac{\sinh x\sqrt{s}}{\sinh a\sqrt{s}}$	$\frac{2\pi}{a^2} \sum_{n=1}^{\infty} (-1)^n n e^{-n^2\pi^2 t/a^2} \sin \frac{n\pi x}{a}$
32.149	$\frac{\cosh x\sqrt{s}}{\cosh a\sqrt{s}}$	$\frac{\pi}{a^2} \sum_{n=1}^{\infty} (-1)^{n-1} (2n-1) e^{-(2n-1)^2\pi^2 t/4a^2} \cos \frac{(2n-1)\pi x}{2a}$
32.150	$\frac{\sinh x\sqrt{s}}{\sqrt{s} \cosh a\sqrt{s}}$	$\frac{2}{a} \sum_{n=1}^{\infty} (-1)^{n-1} e^{-(2n-1)^2\pi^2 t/4a^2} \sin \frac{(2n-1)\pi x}{2a}$
32.151	$\frac{\cosh x\sqrt{s}}{\sqrt{s} \sinh a\sqrt{s}}$	$\frac{1}{a} + \frac{2}{a} \sum_{n=1}^{\infty} (-1)^n e^{-n^2\pi^2 t/a^2} \cos \frac{n\pi x}{a}$
32.152	$\frac{\sinh x\sqrt{s}}{s \sinh a\sqrt{s}}$	$\frac{x}{a} + \frac{2}{\pi} \sum_{n=1}^{\infty} \frac{(-1)^n}{n} e^{-n^2\pi^2 t/a^2} \sin \frac{n\pi x}{a}$
32.153	$\frac{\cosh x\sqrt{s}}{s \cosh a\sqrt{s}}$	$1 + \frac{4}{\pi} \sum_{n=1}^{\infty} \frac{(-1)^n}{2n-1} e^{-(2n-1)^2\pi^2 t/4a^2} \cos \frac{(2n-1)\pi x}{2a}$
32.154	$\frac{\sinh x\sqrt{s}}{s^2 \sinh a\sqrt{s}}$	$\frac{xt}{a} + \frac{2a^2}{\pi^3} \sum_{n=1}^{\infty} \frac{(-1)^n}{n^3} (1 - e^{-n^2\pi^2 t/a^2}) \sin \frac{n\pi x}{a}$
32.155	$\frac{\cosh x\sqrt{s}}{s^2 \cosh a\sqrt{s}}$	$\frac{1}{2}(x^2 - a^2) + t - \frac{16a^2}{\pi^3} \sum_{n=1}^{\infty} \frac{(-1)^n}{(2n-1)^3} e^{-(2n-1)^2\pi^2 t/4a^2} \cos \frac{(2n-1)\pi x}{2a}$

	$f(s)$	$F(t)$
32.156	$\frac{J_0(ix\sqrt{s})}{s J_0(ia\sqrt{s})}$	$1 - 2 \sum_{n=1}^{\infty} \frac{e^{-\lambda_n^2 t/a^2} J_0(\lambda_n x/a)}{\lambda_n J_1(\lambda_n)}$ where $\lambda_1, \lambda_2, \dots$ are the positive roots of $J_0(\lambda) = 0$
32.157	$\frac{J_0(ix\sqrt{s})}{s^2 J_0(ia\sqrt{s})}$	$\frac{1}{4}(x^2 - a^2) + t + 2a^2 \sum_{n=1}^{\infty} \frac{e^{-\lambda_n^2 t/a^2} J_0(\lambda_n x/a)}{\lambda_n^3 J_1(\lambda_n)}$ where $\lambda_1, \lambda_2, \dots$ are the positive roots of $J_0(\lambda) = 0$
32.158	$\frac{1}{as^2} \tanh\left(\frac{as}{2}\right)$	Triangular wave function  Fig. 32-1
32.159	$\frac{1}{s} \tanh\left(\frac{as}{2}\right)$	Square wave function  Fig. 32-2
32.160	$\frac{\pi a}{a^2 s^2 + \pi^2} \coth\left(\frac{as}{2}\right)$	Rectified sine wave function  Fig. 32-3
32.161	$\frac{\pi a}{(a^2 s^2 + \pi^2)(1 - e^{-as})}$	Half rectified sine wave function  Fig. 32-4
32.162	$\frac{1}{as^2} - \frac{e^{-as}}{s(1 - e^{-as})}$	Saw tooth wave function  Fig. 32-5

	$f(s)$	$F(t)$
32.163	$\frac{e^{-as}}{s}$ See also entry 32.138.	Heaviside's unit function $\mathcal{U}(t-a)$  Fig. 32-6
32.164	$\frac{e^{-as}(1 - e^{-cs})}{s}$	Pulse function  Fig. 32-7
32.165	$\frac{1}{s(1 - e^{-as})}$ See also entry 32.102.	Step function  Fig. 32-8
32.166	$\frac{e^{-s} + e^{-2s}}{s(1 - e^{-s})^2}$	$F(t) = n^2, n \leq t < n+1, n = 0, 1, 2, \dots$  Fig. 32-9
32.167	$\frac{1 - e^{-s}}{s(1 - re^{-s})}$ See also entry 32.104.	$F(t) = r^n, n \leq t < n+1, n = 0, 1, 2, \dots$  Fig. 32-10
32.168	$\frac{\pi a(1 + e^{-as})}{a^2 s^2 + \pi^2}$	$F(t) = \begin{cases} \sin(\pi t/a) & 0 \leq t \leq a \\ 0 & t > a \end{cases}$  Fig. 32-11