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

$F(t)$	$f(s)$
1	$\frac{1}{s}$
t^n	$\frac{n!}{s^{n+1}} = \frac{\Gamma(n+1)}{s^{n+1}}$
e^{at}	$\frac{1}{s-a}$
$\sin at$	$\frac{a}{s^2+a^2}$
$\cos at$	$\frac{s}{s^2+a^2}$
$\sinh at$	$\frac{a}{s^2-a^2}$
$\cosh at$	$\frac{s}{s^2-a^2}$

$$\mathcal{L}\{t^4\} = \frac{4!}{s^{4+1}} = \frac{24}{s^5}$$

$$\mathcal{L}\{t^{1.5}\}$$

$\Gamma(1) = 1 \qquad \Gamma(\tfrac{1}{2}) = \sqrt{\pi}$

$$\Gamma(n) = (n-1)\Gamma(n-1) = (n-1)(n-2)\Gamma(n-2)$$

$$\Gamma(5) = 4\Gamma(4) = 4\cdot 3\Gamma(3) = 4\cdot 3\cdot 2\Gamma(2)$$
$$= 4\cdot 3\cdot 2\cdot 1\,\Gamma(1)$$

$$\mathcal{L}\{t^{\frac{1}{2}}\} = \frac{\Gamma(\frac{3}{2})}{s^{3/2}} = \frac{\frac{1}{2}\Gamma(\frac{1}{2})}{s^{3/2}} = \frac{\frac{1}{2}\sqrt{\pi}}{s^{3/2}}$$

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

$f(t)$	$F(s)$
1	$\frac{1}{s}$
t^n	$\frac{n!}{s^{n+1}} = \frac{\Gamma(n+1)}{s^{n+1}}$
e^{at}	$\frac{1}{s-a}$
$\sin at$	$\frac{a}{s^2+a^2}$
$\cos at$	$\frac{s}{s^2+a^2}$
$\sinh at$	$\frac{a}{s^2-a^2}$
$\cosh at$	$\frac{s}{s^2-a^2}$

$$\mathcal{L}\{5t+9\} = \mathcal{L}\{5t\} + \mathcal{L}\{9\}$$
$$= 5\mathcal{L}\{t\} + \mathcal{L}\{9\}$$
$$= 5\mathcal{L}\{t\} + 9\mathcal{L}\{1\}$$
$$= 5\,\frac{1}{s^2} + 9\,\frac{1}{s} = \frac{5}{s^2} + \frac{9}{s}$$

$$\mathcal{L}\{t^{10} + t^4 + 2\} = \mathcal{L}\{t^{10}\} + \mathcal{L}\{t^4\} + 2\mathcal{L}\{1\}$$
$$= \frac{10!}{s^{11}} + \frac{4!}{s^5} + 2\,\frac{1}{s}$$

$$\mathcal{L}\{t^n\} = \frac{\Gamma(n+1)}{s^{n+1}}$$

$$\mathcal{L}\left\{1+\sqrt{t}+\frac{3}{\sqrt{t}}\right\} = \mathcal{L}\left\{1+t^{\frac{1}{2}}+3t^{-\frac{1}{2}}\right\}$$

$$= \mathcal{L}\{1\} + \mathcal{L}\{t^{\frac{1}{2}}\} + 3\mathcal{L}\{t^{-\frac{1}{2}}\}$$

$$= \frac{1}{s} + \frac{\Gamma(3/2)}{s^{3/2}} + 3\,\frac{\Gamma(1/2)}{s^{1/2}}$$

$$= \frac{1}{s} + \frac{\frac{1}{2}\Gamma(1/2)}{s^{3/2}} + 3\,\frac{\Gamma(1/2)}{s^{1/2}} = \frac{1}{s} + \frac{\sqrt{\pi}}{2s^{3/2}} + 3\,\frac{\sqrt{\pi}}{s^{1/2}}$$

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

$F(t)$	$f(s)$
1	$\frac{1}{s}$
t^n	$\frac{n!}{s^{n+1}} = \frac{\Gamma(n+1)}{s^{n+1}}$
e^{at}	$\frac{1}{s-a}$
$\sin at$	$\frac{a}{s^2+a^2}$
$\cos at$	$\frac{s}{s^2+a^2}$
$\sinh at$	$\frac{a}{s^2-a^2}$
$\cosh at$	$\frac{s}{s^2-a^2}$

$$\mathcal{L}\{e^{-4t} + e^{2t}\} = \mathcal{L}\{e^{-4t}\} + \mathcal{L}\{e^{2t}\}$$

$$= \frac{1}{s-(-4)} + \frac{1}{s-2} = \frac{1}{s+4} + \frac{1}{s-2}$$

$$\mathcal{L}\{e^{3t} + t^3\} = \mathcal{L}\{e^{3t}\} + \mathcal{L}\{t^3\}$$

$$= \frac{1}{s-3} + \frac{3!}{s^4}$$

$$\mathcal{L}\{f(t)\} = \int_0 e \ldots dt = F(s)$$

$f(t)$	$F(s)$
1	$\frac{1}{s}$
t^n	$\frac{n!}{s^{n+1}} = \frac{\Gamma(n+1)}{s^{n+1}}$
e^{at}	$\frac{1}{s-a}$
$\sin at$	$\frac{a}{s^2+a^2}$
$\cos at$	$\frac{s}{s^2+a^2}$
$\sinh at$	$\frac{a}{s^2-a^2}$
$\cosh at$	$\frac{s}{s^2-a^2}$

$$\mathcal{L}\{\sin(12t) - 3\cos\sqrt{2}\,t\} = \mathcal{L}\{\sin 12t\} - 3\mathcal{L}\{\cos\sqrt{2}\,t\}$$

$$= \frac{12}{s^2+(12)^2} - 3\frac{s}{s^2+(\sqrt{2})^2}$$

$$\mathcal{L}\{\sinh \overset{a=4}{4t} + \cosh \overset{a=4}{4t}\}$$

$$= \mathcal{L}\{\sinh 4t\} + \mathcal{L}\{\cosh 4t\}$$

$$= \frac{(4)}{s^2-(4)^2} + \frac{s}{s^2-(4)^2}$$

CamScanner

النمط الافتراضي

	$\frac{}{s^2+a^2}$
$\cos at$	$\frac{s}{s^2+a^2}$
$\sinh at$	$\frac{a}{s^2-a^2}$
$\cosh at$	$\frac{s}{s^2-a^2}$

$$\mathcal{L}\{\sinh 4t + \cosh 4t\} \quad a=4$$

$$= \mathcal{L}\{\sinh 4t\} + \mathcal{L}\{\cosh 4t\}$$

$$= \frac{(4)}{s^2-(4)^2} + \frac{s}{s^2-(4)^2}$$

$$\mathcal{L}\{\sin \pi t + e^{6t}\} = \mathcal{L}\{\sin \pi t\} + \mathcal{L}\{e^{6t}\}$$

$$= \frac{(\pi)}{s^2+(\pi)^2} + \frac{1}{s-6}$$

أدوات رمز الـ تبديل القلم الممحاة شكل تخطيط الـ تراجع تكرار تحديد مرة واحدة مسح تبديل إضافة السابق 1/1 التالي القائمة

النمط الإفتراضي

$$\sin^2 x + \cos^2 x = 1$$

$$\sin(x \pm y) = \sin x \cos y \pm \sin y \cos x$$

$$\# \cos(x \pm y) = \cos x \cos y \mp \sin x \sin y$$

$$\sin^2 x = \frac{1}{2}(1 - \cos 2x)$$

$$\cos^2 x = \frac{1}{2}(1 + \cos 2x)$$

$$\sin x \sin y = \frac{1}{2}[\cos(x-y) - \cos(x+y)]$$

$$\cos x \cos y = \frac{1}{2}[\cos(x-y) + \cos(x+y)]$$

$$\sin x \cos y = \frac{1}{2}[\sin(x-y) + \sin(x+y)]$$

$$\cos(-x) = \cos x \qquad \sin(-x) = -\sin x$$

$$\sin(-x) = -\sin x$$

1	$\frac{1}{s}$
t^n	$\frac{n!}{s^{n+1}} = \frac{\Gamma(n+1)}{s^{n+1}}$
e^{at}	$\frac{1}{s-a}$
$\sin at$	$\frac{a}{s^2+a^2}$
$\cos at$	$\frac{s}{s^2+a^2}$
$\sinh at$	$\frac{a}{s^2-a^2}$
$\cosh at$	$\frac{s}{s^2-a^2}$

أدوات رمز ال... تبديل القلم الممحاة شكل تخطيط ال... تراجع تكرار تحديد مرة واحدة مسح تبديل إضافة

النمط الإفتراضي

$$= \cosh \frac{s}{s^2+a^2} - \sinh \frac{a}{s^2+a^2}$$

$$\mathcal{L}\{\cos^2 4t\} = \mathcal{L}\left\{\frac{1}{2}\left[1+\cos 8t\right]\right\}$$

$$= \frac{1}{2}\left[\mathcal{L}\{1\} + \mathcal{L}\{\cos 8t\}\right]$$

$$= \frac{1}{2}\left[\frac{1}{s} + \frac{s}{s^2+8^2}\right]$$

أدوات رمز الـ تبديل الثم الممحاة شكل الخطوط الـ تراجع تكرار تحديد مرة واحدة مسح تبديل إضافة السابق 1/1

$$\mathcal{L}\{\sin^2 2t\} = \mathcal{L}\left\{\frac{1}{2}\left[1-\cos 4t\right]\right\}$$

$$= \frac{1}{2}\left[\mathcal{L}\{1\} - \mathcal{L}\{\cos 4t\}\right] = \frac{1}{2}\left[\frac{1}{s} - \frac{s}{s^2+4^2}\right]$$

$$\mathcal{L}\{\cos 4t \cos t\} = \mathcal{L}\left\{\frac{1}{2}\left[\cos(3t) + \cos(5t)\right]\right\}$$

$$= \frac{1}{2}\left[\mathcal{L}\{\cos 3t\} + \mathcal{L}\{\cos 5t\}\right]$$

$$= \frac{1}{2}\left[\frac{s}{s^2+(3)^2} + \frac{s}{s^2+5^2}\right]$$

الترتيب مهم sin الاول دائما

$$\mathcal{L}\{\cos 5t \sin 2t\} = \mathcal{L}\{\sin 2t \cos 5t\}$$

النمط الإفتراضي

$\mathcal{L}\left\{\frac{1}{2}(\sin(-3t)+\sin(7t))\right\}$

$=\frac{1}{2}\left[\mathcal{L}\{\sin(-3t)\}+\mathcal{L}\{\sin 7t\}\right]$

$\sin(-3t)=-\sin 3t$

$=\frac{1}{2}\left[\frac{(-3)}{s^2+(-3)^2}+\frac{7}{s^2+49}\right]=\frac{1}{2}\left[\frac{-3}{s^2+9}+\frac{7}{s^2+49}\right]$

$-\frac{3}{s^2+9}$

$\mathcal{L}\{(\sin t-\cos t)^2\}$

$(\sin t-\cos t)^2=\sin^2 t-2\sin t\cos t+\cos^2 t$

$=(\sin^2 t+\cos^2 t)-2\sin t\cos t$

$=1-2\,\frac{1}{2}(\cancel{\sin(0)}^{0}+\sin(2t))$

$=1-\sin 2t$

$\mathcal{L}\{1-\sin 2t\}=\mathcal{L}\{1\}-\mathcal{L}\{\sin 2t\}$

$=\frac{1}{s}-\frac{2}{s^2+4}$

النمط الإفتراضي

١٢:٢٣

$\mathcal{L}\{\sin^3 2t\}$

$\sin(2t)\ \sin^2(2t) = \sin 2t \cdot \frac{1}{2}(1-\cos 4t)$

$= \frac{1}{2}\left[\sin 2t - \sin 2t \cos 4t\right]$

$= \frac{1}{2}\left[\sin 2t - \frac{1}{2}\left(\sin(-2t) + \sin(6t)\right)\right]$

$= \frac{1}{2}\left[\sin 2t - \frac{1}{2}\left(-\sin 2t + \sin 6t\right)\right]$

$= \frac{1}{2}\left[\sin 2t + \frac{1}{2}\sin 2t - \frac{1}{2}\sin 6t\right]$

$\mathcal{L}\{\sin^3 2t\} = \mathcal{L}\left\{\frac{1}{2}\left[\frac{3}{2}\sin 2t - \frac{1}{2}\sin 6t\right]\right\}$

$= \frac{1}{2}\left[\frac{3}{2}\frac{2}{s^2+4} - \frac{1}{2}\frac{6}{s^2+36}\right]$

أدوات رمز الـ تحويل القلم الممحاة شكل تخطيط الـ تراجع تكرار تحديد مرة واحدة مسح تبديل إضافة السابق 3/3 التالي

النمط الإفتراضي

$$\mathcal{L}\left\{\frac{1}{2}\left[\frac{3}{2}\sin 2t - \frac{1}{2}\sin 6t\right]\right\}$$

$$= \frac{1}{2}\left[\frac{3}{2}\,\frac{2}{s^2+4} - \frac{1}{2}\,\frac{6}{s^2+36}\right]$$

$$\mathcal{L}\{\cos^3 2t + t^2\}$$

$$\frac{2}{s^3}$$

$$\cos^3 2t = \cos^2 2t \cdot \cos 2t$$

$$= \frac{1}{2}(1+\cos 4t)\cdot \cos 2t$$

$$= \frac{1}{2}\left[\cos 2t + \cos 2t \cos 4t\right]$$

$$= \frac{1}{2}\left[\cos 2t + \frac{1}{2}\left(\cos(-2t) + \cos(6t)\right)\right]$$

$$= \frac{1}{2}\left[\cos 2t + \frac{1}{2}\left(\cos 2t + \cos 6t\right)\right]$$

$$= \frac{1}{2}\left[\cos 2t + \frac{1}{2}\cos 2t + \frac{1}{2}\cos 6t\right]$$

$$= \frac{1}{2}\left[\frac{3}{2}\cos 2t + \frac{1}{2}\cos 6t\right]$$

$$\mathcal{L}\{\cos^3 2t + t^2\} = \frac{1}{2}\left[\frac{3}{2}\,\frac{s}{s^2+4} + \frac{1}{2}\,\frac{s}{s^2+36}\right] + \frac{2}{s^3}$$

أدوات رمز الب... تبديل القلم الممحاة شكل تخطيط ال... تراجع تكرار تحديد حرة واحدة مسح

CamScanner