Elementary Laplace Transforms

$f(t) = L^{-1}\{F(p)\}$	$F(p) = L\{f(t)\}$	
1	$\frac{1}{p}$	$p > 0$ (1)
e^{at}	$\frac{1}{p-a}$	$p > a$ (2)
$\sin at$	$\frac{a}{p^2+a^2}$	$p > 0$ (3)
$\cos at$	$\frac{p}{p^2+a^2}$	$p > 0$ (4)
$t^n, \quad n \in N$	$\frac{n!}{p^{n+1}}$	$p > 0$ (5)
$t \cos at$	$\frac{p^2-a^2}{(p^2+a^2)^2}$	$p > 0$ (13)
$\frac{\sin at - at\cos at}{2a^3}$	$\frac{1}{(p^2+a^2)^2}$	$p > 0$ (14)
$u_c(t)$	$\frac{e^{-cp}}{p}$	$p > 0$ (15)
$u_c(t)\, f(t-c)$	$e^{-cp}\, F(p)$	(16)
$e^{ct}\, f(t)$	$F(p-c)$	(17)
$f(ct)$	$\frac{1}{c} F\left(\frac{p}{c}\right)$	$c > 0$ (18)
$\int_0^t f_1(t-\tau) f_2(\tau) d\tau$	$F_1(p) F_2(p)$	(19)
$\delta(t-c)$	e^{-cp}	(20)
$(-t)^n f(t)$	$F^{(n)}(p)$	(21)
$f^{(n)}(t)$	$p^n F(p) - p^{n-1} f(0) - \cdots - f^{(n-1)}(0)$	(22)

אינטגרלים מיידיים

1. $\int x^a dx = \frac{x^{a+1}}{a+1} + C \quad (a \neq -1)$

2. $\int a^x dx = \frac{a^x}{\ln a} + C$

3. $\int e^x dx = e^x + C$

4. $\int \frac{dx}{x} = \ln|x| + C$

5. $\int \sin x\, dx = -\cos x + C$

6. $\int \cos x\, dx = \sin x + C$

7. $\int \frac{dx}{\sin ax} = \frac{1}{a}\ln\left|\tan\frac{ax}{2}\right| + C$

8. $\int \frac{dx}{\cos ax} = \frac{1}{a}\ln\left|\tan\left(\frac{\pi}{4}+\frac{ax}{2}\right)\right| + C$

9. $\int \frac{dx}{sin^2 ax} = -\frac{1}{a}\cot ax + C$

10. $\int \frac{dx}{cos^2 ax} = \frac{1}{a}\tan ax + C$

11. $\int \tan x\, dx = -\ln|\cos x| + C$

12. $\int \cot x\, dx = \ln|\sin x| + C$

13. $\int \frac{dx}{a^2+x^2} = \frac{1}{a} arctan\, \frac{x}{a} + C$

14. $\int \frac{dx}{a^2-x^2} = \frac{1}{2a}\ln\left|\frac{a+x}{a-x}\right| + C$

15. $\int \frac{dx}{x^2-a^2} = \frac{1}{2a}\ln\left|\frac{a-x}{a+x}\right| + C$

16. $\int \frac{dx}{\sqrt{a^2-x^2}} = arcsin\, \frac{x}{a} + C$

17. $\int \frac{dx}{\sqrt{x^2 \pm a^2}} = \ln\left|x+\sqrt{x^2 \pm a^2}\right| + C$

18. $\int \sqrt{x^2+a^2}\, dx = \frac{x\sqrt{x^2+a^2}}{2} + \frac{a^2}{2}\ln\left(x+\sqrt{x^2+a^2}\right) + C$

19. $\int \sqrt{x^2-a^2}\, dx = \frac{x\sqrt{x^2-a^2}}{2} - \frac{a^2}{2}\ln\left(x+\sqrt{x^2-a^2}\right) + C$

20. $\int \sqrt{a^2-x^2}\, dx = \frac{x\sqrt{a^2-x^2}}{2} + \frac{a^2}{2} arcsin\frac{x}{a} + C$

טריגונומטריה

זהויות

הזהויות היסודיות

$$\tan\alpha = \frac{\sin\alpha}{\cos\alpha} \qquad \cot\alpha = \frac{\cos\alpha}{\sin\alpha} \qquad \tan\alpha = \frac{1}{\cot\alpha}$$

$$\sin^2\alpha + \cos^2\alpha = 1 \qquad 1+\tan^2\alpha = \frac{1}{\cos^2\alpha} \qquad 1+\cot^2\alpha = \frac{1}{\sin^2\alpha}$$

סכום והפרש זויות

$$\sin(\alpha \pm \beta) = \sin\alpha\cos\beta \pm \cos\alpha\sin\beta \qquad \cos(\alpha \pm \beta) = \cos\alpha\cos\beta \mp \sin\alpha\sin\beta$$

$$\tan(\alpha+\beta) = \frac{\tan\propto + \tan\beta}{1-\tan\alpha\tan\beta} \qquad \tan(\alpha-\beta) = \frac{\tan\alpha - \tan\beta}{1+\tan\alpha\tan\beta}$$

זוית כפולה וחצי זוית

$$\sin 2\alpha = 2\sin\alpha\cos\alpha \qquad \cos 2\alpha = cos^2\,\alpha - \sin^2\alpha$$

$$\tan 2\alpha = \frac{2\tan\alpha}{1-\tan^2\alpha} \qquad \cot 2\alpha = \frac{\cot^2\alpha - 1}{2\cot\alpha}$$

$$\sin^2\alpha = \frac{1-\cos 2\alpha}{2} \qquad \cos^2\alpha = \frac{1+\cos 2\alpha}{2}$$

$$\sin\frac{\alpha}{2} = \pm\sqrt{\frac{1-\cos\alpha}{2}} \qquad \cos\frac{\alpha}{2} = \pm\sqrt{\frac{1+\cos\alpha}{2}}$$

$$\tan\frac{\alpha}{2} = \frac{1-\cos\alpha}{\sin\alpha} = \frac{\sin\alpha}{1+\cos\alpha} \qquad \tan^2\frac{\alpha}{2} = \frac{1-\cos\alpha}{1+\cos\alpha}$$

סכום והפרש פונקציות

$$\sin\alpha + \sin\beta = 2\sin\frac{\alpha+\beta}{2}\cos\frac{\alpha-\beta}{2} \qquad \sin\alpha - \sin\beta = 2\sin\frac{\alpha-\beta}{2}\cos\frac{\alpha+\beta}{2}$$

$$\cos\alpha + \cos\beta = 2\cos\frac{\alpha+\beta}{2}\cos\frac{\alpha-\beta}{2} \qquad \cos\alpha - \cos\beta = -2\sin\frac{\alpha+\beta}{2}\sin\frac{\alpha-\beta}{2}$$

מכפלת פונקציות

$$\sin\alpha\cos\beta = \frac{1}{2}[\sin(\alpha+\beta) + \sin(\alpha-\beta)] \qquad \cos\alpha\sin\beta = \frac{1}{2}[\sin(\alpha+\beta) - \sin(\alpha-\beta)]$$

$$\cos\alpha\cos\beta = \frac{1}{2}[\cos(\alpha-\beta) + \cos(\alpha+\beta)] \qquad \sin\alpha\sin\beta = \frac{1}{2}[\cos(\alpha-\beta) - \cos(\alpha+\beta)]$$