15 . טבלת הנגזרות

$$\left(x^{\alpha}\right)' = \alpha\, x^{\alpha-1} \quad \text{במקרה פרטי} \quad \left(\sqrt{x}\right)' = \frac{1}{2\sqrt{x}}$$

$$\left(a^{x}\right)' = a^{x}\ln a \quad \text{במקרה פרטי} \quad \left(e^{x}\right)' = e^{x}$$

$$\left(\log_a x\right)' = \frac{1}{x\ln a} = \frac{\log_a e}{x} \quad \text{במקרה פרטי} \quad \left(\ln x\right)' = \frac{1}{x}$$

$$\left(\sin x\right)' = \cos x, \qquad \left(\cos x\right)' = -\sin x, \qquad \left(\tan x\right)' = \frac{1}{\cos^2 x}, \qquad \left(\cot x\right)' = -\frac{1}{\sin^2 x}$$

$$\left(\arcsin x\right)' = \frac{1}{\sqrt{1-x^2}} \quad \text{כאשר } |x|<1 \quad \left(\arccos x\right)' = -\frac{1}{\sqrt{1-x^2}}$$

$$\left(\arctan x\right)' = \frac{1}{1+x^2}, \qquad \left(\operatorname{arc\,cot} x\right)' = -\frac{1}{1+x^2}$$

$$\left(\sinh x\right)' = \cosh x \;,\; \left(\cosh x\right)' = \sinh x \;,\; \left(\tanh x\right)' = \frac{1}{\cosh^2 x} \;,\; \left(\coth x\right)' = -\frac{1}{\sinh^2 x}$$

16 . טבלת האינטגרלים

$$\int \frac{dx}{x} = \ln|x| + C \;, \qquad \int x^{\alpha}dx = \frac{x^{\alpha+1}}{\alpha+1} + C \quad \text{כאשר } \alpha \neq -1$$

$$\int a^{x}dx = \frac{a^{x}}{\ln a} + C, \quad (a>0) \quad \text{במקרה פרטי} \quad \int e^{x}dx = e^{x} + C$$

$$\int \cos x dx = \sin x + C \;, \qquad \int \sin x dx = -\cos x + C$$

$$\int \frac{dx}{\sin x} = \ln\left|\tan\frac{x}{2}\right| + C \;, \qquad \int \frac{dx}{\cos x} = \ln\left|\tan\left(\frac{x}{2}+\frac{\pi}{4}\right)\right| + C$$

$$\int \frac{dx}{\sin^2 x} = -\cot x + C \;, \qquad \int \frac{dx}{\cos^2 x} = \tan x + C$$

$$\int \frac{dx}{x^2+a^2} = \frac{1}{a}\arctan\frac{x}{a} + C, \quad (a\neq 0)$$

$$\int \frac{dx}{x^2-a^2} = \frac{1}{2a}\ln\left|\frac{x-a}{x+a}\right| + C, \quad (a\neq 0) \;, \int \frac{dx}{a^2-x^2} = \frac{1}{2a}\ln\left|\frac{a+x}{a-x}\right| + C$$

$$\int \frac{dx}{\sqrt{a^2-x^2}} = \arcsin\frac{x}{a} + C, \quad (a>0), \int \frac{dx}{\sqrt{x^2+a}} = \ln\left|x+\sqrt{x^2+a}\right| + C, \quad (a\neq 0)$$

$$\int \sinh x dx = \cosh x + C \;, \int \cosh x dx = \sinh x + C$$

$$\int \frac{dx}{\cosh^2 x} = \tanh x + C \;, \int \frac{dx}{\sinh^2 x} = -\coth x + C$$

17 . שיטות האינטגרציה

(1) אם $F(x)$ פונקציה קדומה של $f(x)$, אז $\int f(ax+b)dx = \frac{1}{a}F(ax+b) + C$

(2) אם $x = g(t)$, אז $\int f(x)dx = \int f(t)g'(t)dt$

(3) אינטגרציה בחלקים : $\int u(x)\cdot v'(x)dx = u(x)\cdot v(x) - \int v(x)\cdot u'(x)dx$

6) כמויות טריגונומטריות

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

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

$$\tan\alpha\pm\tan\beta=\frac{\sin(\alpha\pm\beta)}{\cos\alpha\cos\beta}.\qquad \cot\alpha\pm\cot\beta=\frac{\sin(\alpha\pm\beta)}{\sin\alpha\sin\beta}$$

$$\cos\alpha\cdot\cos\beta=\frac{1}{2}(\cos(\alpha-\beta)+\cos(\alpha+\beta))$$

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

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

	$-\alpha$	$\frac{\pi}{2}-\alpha$	$\frac{\pi}{2}+\alpha$	$\pi-\alpha$	$\pi+\alpha$	$\frac{3\pi}{2}-\alpha$	$\frac{3\pi}{2}+\alpha$
$\sin\alpha$	$-\sin\alpha$	$\cos\alpha$	$\cos\alpha$	$\sin\alpha$	$-\sin\alpha$	$-\cos\alpha$	$-\cos\alpha$
$\cos\alpha$	$\cos\alpha$	$\sin\alpha$	$-\sin\alpha$	$-\cos\alpha$	$-\cos\alpha$	$-\sin\alpha$	$\sin\alpha$
$\tan\alpha$	$-\tan\alpha$	$\cot\alpha$	$-\cot\alpha$	$-\tan\alpha$	$\tan\alpha$	$\cot\alpha$	$-\cot\alpha$
$\cot\alpha$	$-\cot\alpha$	$\tan\alpha$	$-\tan\alpha$	$-\cot\alpha$	$\cot\alpha$	$\tan\alpha$	$-\tan\alpha$

	0	$\frac{\pi}{6}$	$\frac{\pi}{4}$	$\frac{\pi}{3}$	$\frac{\pi}{2}$	π
$\sin\alpha$	0	$\frac{1}{2}$	$\frac{1}{\sqrt{2}}$	$\frac{\sqrt{3}}{2}$	1	0
$\cos\alpha$	1	$\frac{\sqrt{3}}{2}$	$\frac{1}{\sqrt{2}}$	$\frac{1}{2}$	0	-1
$\tan\alpha$	0	$\frac{1}{\sqrt{3}}$	1	$\sqrt{3}$	∞	0
$\cot\alpha$	∞	$\sqrt{3}$	1	$\frac{1}{\sqrt{3}}$	0	∞

12. זהויות טריגונומטריות

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

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

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

$$\tan(\alpha\pm\beta)=\frac{\tan\alpha\pm\tan\beta}{1\mp\tan\alpha\tan\beta},\qquad \cot(\alpha\pm\beta)=\frac{\cot\alpha\cot\beta\mp1}{\cot\alpha\pm\cot\beta}$$

$$\sin2\alpha=2\sin\alpha\cos\beta,\qquad \cos2\alpha=\cos^2\alpha-\sin^2\alpha,\qquad \tan2\alpha=\frac{2\tan\alpha}{1-\tan^2\alpha}$$

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

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

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