تكامل الدوال المثلثية

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

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

$$\int \sin(kx)\,dx = -\frac{\cos kx}{k} + C$$

$$\int \cos(kx)\,dx = \frac{\sin(kx)}{k} + C$$

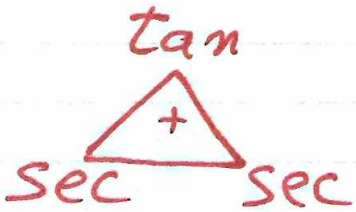
$$\int \sec^2 x\,dx = \tan x + C$$

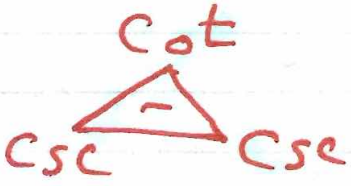
$$\int \csc^2 x\,dx = -\cot x + C$$

$$\int \sec x \cdot \tan x\,dx = \sec x + C$$

$$\int \csc x \cdot \cot x \cdot dx = -\csc x + C$$

اتجاه الرسم اشتقاق
عكس الرسم تكامل





$$\int \cos 4x \, dx = \frac{\sin 4x}{4} + C$$

$$\int \sin 5x \, dx = -\frac{\cos 5x}{5} + C$$

$$\int (\cos x + \csc^2 x) dx = \sin x - \cot x + C$$

$$\int (\sin x + \sec^2 x) dx = -\cos x + \tan x + C$$

$$\int \sec x (\tan x + \sec x) dx$$

$$= \int [\sec x \cdot \tan x + \sec^2 x] dx$$

$$= \sec x + \tan x + C$$

$$\int \csc x (\cot x + \csc x) dx$$

$$= \int (\csc x \cdot \cot x + \csc^2 x) dx$$

$$= -\csc x - \cot x + C$$

$$\int \frac{dx}{\sin^2 x} = \int \csc^2 x\, dx = -\cot x + c$$

$$\int \frac{dx}{\cos^2 x} = \int \sec^2 x\, dx = \tan x + c$$

$$\int (2x - \sin 3x)\, dx = x^2 + \frac{\cos 3x}{3} + c$$

$$\int (x^2 + \cos 2x)\, dx = \frac{x^3}{3} + \frac{\sin 2x}{2} + c$$

$$= \frac{1}{3}x^3 + \frac{1}{2}\sin 2x + c$$

$\sec = \frac{1}{\cos}$

$\csc = \frac{1}{\sin}$

$\cot = \frac{1}{\tan}$

$\tan = \frac{\sin}{\cos}$

أوجد

$$\int x^2 \cdot \sin(x^3-1)\,dx$$

الحل

$$I = \int \sin(x^3-1)\cdot x^2\,dx$$

$$= \int \sin u \cdot \frac{1}{3}\,du$$

$$= \frac{1}{3}\int \sin u \cdot du$$

$$= \frac{1}{3}(-\cos u) + c$$

$$= -\frac{1}{3}\cos(x^3-1) + c$$

$$u = x^3 - 1$$

$$du = 3x^2\,dx$$

$$\frac{1}{3}du = x^2\,dx$$

أوجد

$$\int x^3 \cos(x^4+5)\,dx$$

الحل

$$I = \int \cos(x^4+5)\cdot x^3\,dx$$

$$= \frac{1}{4}\int \cos u \cdot du$$

$$= \frac{1}{4}\sin u + c$$

$$= \frac{1}{4}\sin(x^4+5) + c$$

$$u = x^4 + 5$$

$$du = 4x^3\,dx$$

$$\frac{1}{4}du = x^3\,dx$$

أوجد

$$\int x \cdot \sec^2(x^2+2)\,dx$$

الحل

$$= \int \sec^2(x^2+2) \cdot x\,dx$$

$$= \int \sec^2 u \cdot \frac{1}{2}\,du$$

$$= \frac{1}{2}\int \sec^2 u\,du$$

$$= \frac{1}{2}\tan u + C$$

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

$$u = x^2+2$$
$$du = 2x\,dx$$
$$\frac{1}{2}du = x\,dx$$

أوجد

$$\int x \cdot \csc^2(x^2-1)\,dx$$

الحل

$$= \int \csc^2(x^2-1) \cdot x\,dx$$

$$= \frac{1}{2}\int \csc^2 u \cdot du$$

$$= -\frac{1}{2}\cot u + C$$

$$= -\frac{1}{2}\cot(x^2-1) + C$$

$$u = x^2-1$$
$$du = 2x\,dx$$
$$\frac{1}{2}du = x\,dx$$

أوجد

$$\int \sin^3 x \cdot \cos x \, dx$$

الحل

$$= \int [\sin x]^3 \cdot \cos x \, dx$$

$$= \int u^3 \cdot du$$

$$= \frac{u^4}{4} + C$$

$$= \frac{[\sin x]^4}{4} + C$$

$$u = \sin x$$

$$du = \cos x \cdot dx$$

أوجد

$$\int \cos^4 t \cdot \sin t \, dt$$

الحل

$$= \int [\cos t]^4 \cdot \sin t \, dt$$

$$= \int u^4 \cdot (-du)$$

$$= -\int u^4 \, du$$

$$= -\frac{u^5}{5} + C$$

$$= -\frac{(\cos t)^5}{5} + C$$

$$u = \cos t$$

$$du = -\sin t \, dt$$

$$-du = \sin t \, dt$$

أوجد $\int \sin^5(x+1)\cdot\cos(x+1)\,dx$

الحل

$$= \int [\sin(x+1)]^5 \cdot \cos(x+1)\,dx$$

$$= \int u^5 \cdot du$$

$$= \frac{u^6}{6} + C$$

$$= \frac{[\sin(x+1)]^6}{6} + C$$

$u = \sin(x+1)$

$du = \cos(x+1)\,dx$

أوجد $\int \cos^3(2x-3)\cdot\sin(2x-3)\,dx$

الحل

$$= \int [\cos(2x-3)]^3 \cdot \sin(2x-3)\,dx$$

$$= \int u^3 \cdot -\frac{1}{2}\,du$$

$$= -\frac{1}{2}\int u^3\,du$$

$$= -\frac{1}{2}\cdot\frac{u^4}{4} + C$$

$$= -\frac{1}{8}[\cos(2x-3)]^4 + C$$

$u = \cos(2x-3)$

$du = -2\sin(2x-3)\,dx$

$-\frac{1}{2}du = \sin(2x-3)\,dx$

أوجد $\int (1+\cos x)^6 \cdot \sin x \, dx$

الحل

$$= -\int u^6 \, du$$

$$= -\frac{u^7}{7} + C$$

$$= -\frac{1}{7}(1+\cos x)^7 + C$$

$u = 1+\cos x$

$du = -\sin x \, dx$

$-du = \sin x \, dx$

أوجد $\int (3+\sin 2x)^5 \cdot \cos 2x \, dx$

الحل

$$= \frac{1}{2}\int u^5 \cdot du$$

$$= \frac{1}{2}\,\frac{u^6}{6} + C$$

$$= \frac{1}{12}(3+\sin 2x)^6 + C$$

$u = 3+\sin 2x$

$du = 2\cos 2x \, dx$

$\frac{1}{2}du = \cos 2x \, dx$

$\int \sec^4 x \cdot \tan x \, dx$ أوجد

الحل

$$= \int \sec^3 x \cdot \sec x \cdot \tan x \, dx \quad \| \quad u = \sec x$$

$$= \int (\sec x)^3 \cdot \sec x \cdot \tan x \, dx \quad \| \quad du = \sec x \cdot \tan x \, dx$$

$$= \int u^3 \, du$$

$$= \frac{u^4}{4} + c$$

$$= \frac{(\sec x)^4}{4} + c$$

$\int \csc^5 x \cdot \cot x \, dx$ أوجد

الحل

$$= \int \csc^4 x \cdot \csc x \cdot \cot x \cdot dx \quad \| \quad u = \csc x$$

$$= \int (\csc x)^4 \cdot \csc x \cdot \cot x \cdot dx \quad \| \quad du = -\csc x \cdot \cot x \, dx$$

$$= -\int u^4 \, du \quad \| \quad -du = \csc x \cdot \cot x \, dx$$

$$= -\frac{u^5}{5} + c$$

$$= -\frac{[\csc x]^5}{5} + c$$

أوجد

$$\int \sec^2 x \cdot \tan x \, dx$$

$$= \int \sec x \cdot \sec x \cdot \tan x \, dx$$

$$= \int u \cdot du$$

$$= \frac{u^2}{2} + c$$

$$= \frac{(\sec x)^2}{2} + c$$

$u = \sec x$

$du = \sec x \cdot \tan x \, dx$

أوجد

$$\int \csc^2 x \cdot \cot x \, dx$$

الحل

$$= \int \csc x \cdot \csc x \cdot \cot x \, dx$$

$$= -\int u \cdot du$$

$$= -\frac{u^2}{2} + c$$

$$= -\frac{[\csc x]^2}{2} + c$$

$u = \csc x$

$du = -\csc x \cdot \cot x \cdot dx$

$-du = \csc x \cdot \cot x \cdot dx$