



Enlightism
Spreading Inspiration

Alevel Math

Unit:
Integration
A2

Contributed by Zunaira

~~Date:~~

Integration

Area under the curve

As

$$\int x^n dx = \frac{x^{n+1}}{n+1} + C$$

$$\int (ax+b)^n dx = \frac{(ax+b)^{n+1}}{a(n+1)} + C$$

$$\int_a^b f'(x) dx = f(x) \Big|_a^b$$
$$f(b) - f(a)$$

Rule of thumb

$$\int [f(x)]^n [f'(x)] dx$$
$$\frac{f(x)^{n+1}}{n+1} + C$$

Date:

Integration of Function

$$\int e^x dx = e^x + c$$

$$\int e^{ax} dx = \frac{1}{a} e^{ax} + c$$

$$y = e^{ax}$$

for your
refo

$$\frac{dy}{dx} = ae^{ax}$$

$$\int dy = \int ae^{ax} dx$$

$$y = a \int e^{ax} dx$$

$$\frac{1}{a} y = \int e^{ax} dx$$

$$\frac{1}{a} e^{ax} = \int e^{ax} dx$$

$$\int e^{ax} dx = \frac{1}{a} e^{ax}$$

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Integration of

$$\int \frac{f'(u) du}{f(u)}$$

$$\int \frac{1}{x} dx = \ln|ax+b| + C$$

$$\ln|f(u)| + C$$

$$\ln|x| + C$$

$$\frac{1}{a} \int \frac{a}{ax+b} dx$$

$$\frac{1}{a} \ln|ax+b| + C$$

Integration of trigonometric functions:-

Be sure that integration of \sin^n , \cos^n , \tan^n is not directly possible.

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$$\frac{d}{dx} \sin x = \cos x$$

$$\frac{d}{dx} \cos x = -\sin x$$

$$\frac{d}{dx} \tan x = \sec^2 x$$

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

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

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

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

$$\int \frac{d}{dx} \tan x = \int \sec^2 x$$

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

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

DALMATIAN

Except for these functions, integration is not possible by directly.

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$$\int \sin(ax+b) dx = -\frac{1}{a} \cos(ax+b) + C$$

$$\int \cos(ax+b) dx = \frac{1}{a} \sin(ax+b) + C$$

$$\int \sec^2(ax+b) dx = \frac{1}{a} \tan(ax+b) + C$$

Integration of tangent:-

$$\int \tan x dx$$

$$= \int \frac{\sin x}{\cos x} dx$$

$$= -\ln|\cos x| + C$$

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Integration of

Sin / Cos with even power.

When ever Cos & Sin have an even power Always Apply.

$$\sin^2 A = \frac{1 - \cos 2A}{2} \quad \checkmark$$

$$\cos^2 A = \frac{1 + \cos 2A}{2} \quad \checkmark$$

Example :-

$$\int \sin^2 x \, dx$$

$$= \frac{1}{2} \int [1 - \cos 2x] \, dx$$

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

$$= \frac{x}{2} - \frac{1}{4} \sin 2x + C$$

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$$\int \sin^4 u \, du$$

$$\int (\sin^2 u)^2 \, du$$

$$\cos^2 2x = \frac{1 + \cos 4x}{2}$$

$$= \int \left[\frac{1 - \cos 2u}{2} \right]^2 \, du$$

$$= \frac{1}{4} \int [1 - \cos 2u]^2 \, du$$

$$= \frac{1}{4} \int [1 + \cos^2 2u - 2 \cos 2u] \, du$$

$$= \frac{1}{4} \int 1 \, du - \frac{2}{4} \int \cos 2u \, du$$

$$+ \frac{1}{4} \int \cos^2 2u \, du$$

$$= \frac{x}{4} - \frac{1}{2 \times 2} \sin 2u + \frac{1}{4} \int \frac{1 + \cos 4u}{2} \, du$$

$$\frac{x}{4} - \frac{1}{4} \sin 2u + \frac{1}{2} \int du + \frac{1}{8} \int \cos 4u \, du$$

LAMATIAN

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$$= \frac{x}{4} - \frac{1}{4} \sin 2x + \frac{x}{2} - \frac{1}{3} \sin 4x$$

$$= \frac{3}{4}x - \frac{1}{4} \sin 2x + \frac{1}{3} \sin 4x + c$$

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