Basic Formulae

(i) $\int x^n dx = \frac{x^{n+1}}{n+1} + C, n \neq -1$

(ii) $\int e^{ax}\, dx = \frac{e^{ax}}{a} + C$

(iii) $\int a^x\, dx = \frac{a^x}{\log a} + C$

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

(v) $\int \cos x\, dx = \sin x + C$

(vi) $\int \tan x\, dx = -\log|\cos x| + C = \log|\sec x| + C$

(vii) $\int \cot x\, dx = \log|\sin x| + C = -\log|\mathrm{cosec}\, x| + C$

(viii) $\int \sec x\, dx = \log|\sec x + \tan x| + C = \log\left|\tan\left(\frac{\pi}{4} + \frac{x}{2}\right)\right| + C$

(ix) $\int \mathrm{cosec}\, x\, dx = \log|\mathrm{cosec}\, x - \cot x| + C = \log\left|\tan\frac{x}{2}\right| + C$

(x) $\int \sec x \tan x\, dx = \sec x + C$

(xi) $\int \mathrm{cosec}\, x \cot x\, dx = -\mathrm{cosec}\, x + C$

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

(xiii) $\int \mathrm{cosec}^2 x\, dx = -\cot x + C$

(xiv) $\int \frac{1}{\sqrt{1-x^2}} dx = \sin^{-1} x + C$

(xv) $\int \frac{-1}{\sqrt{1-x^2}} dx = \cos^{-1} x + C$

(xvi) $\int \frac{1}{1+x^2} dx = \tan^{-1} x + C$

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

(xviii) $\int \frac{1}{x\sqrt{x^2-1}} dx = \sec^{-1} x + C$

(xix) $\int \frac{-1}{x\sqrt{x^2-1}} dx = \mathrm{cosec}^{-1} x + C$

(xx) $\int \frac{dx}{\sqrt{a^2-x^2}} = \sin^{-1}\frac{x}{a} + C$

(xxi) $\int \frac{dx}{\sqrt{x^2-a^2}} = \log|x + \sqrt{x^2-a^2}| + C$

(xxii) $\int \frac{dx}{\sqrt{x^2+a^2}} = \log|x + \sqrt{x^2+a^2}| + C$

(xxiii) $\int \frac{1}{a^2+x^2} dx = \frac{1}{a}\tan^{-1}\left(\frac{x}{a}\right) + C$

(xxiv) $\int \frac{1}{a^2-x^2} dx = \frac{1}{2a}\log\left|\frac{a+x}{a-x}\right| + C$

(xxv) $\int \frac{dx}{x^2-a^2} = \frac{1}{2a}\log\left|\frac{x-a}{x+a}\right| + C$

(xxvi) $\int \sqrt{x^2-a^2}\, dx = \frac{x}{2}\sqrt{x^2-a^2} - \frac{a^2}{2}\log\left|x + \sqrt{x^2-a^2}\right| + C$

(xxvii) $\int \sqrt{a^2-x^2}\, dx = \frac{x}{2}\sqrt{a^2-x^2} + \frac{a^2}{2}\sin^{-1}\frac{x}{a} + C$

(xxviii) $\int \sqrt{x^2+a^2}\, dx = \frac{x}{2}\sqrt{x^2+a^2} + \frac{a^2}{2}\log\left|x + \sqrt{x^2+a^2}\right| + C$

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

(xxx) $\int e^x[f(x) + f'(x)]\, dx = f(x)\, e^x + C$

Integration using Trigonometric Identities

When the integrand involves some trigonometric functions, we use the following identities to find the integral:

- $2 \sin A \,.\, \cos B = \sin(A + B) + \sin(A - B)$
- $2 \cos A \,.\, \sin B = \sin(A + B) - \sin(A - B)$
- $2 \cos A \,.\, \cos B = \cos(A + B) + \cos(A - B)$
- $2 \sin A \,.\, \sin B = \cos(A - B) - \cos(A + B)$
- $2 \sin A \cos A = \sin 2A$
- $\cos^2 A - \sin^2 A = \cos 2A$
- $\sin^2 A = (1 - \cos 2A)/2$
- $\cos^2 A = (1 + \cos 2A)/2$
- $\sin^2 A + \cos^2 A = 1$
- sin3A=3sinA−sin3A4
- cos3A=3cosA+cos3A4