IIT-JAM MATHEMATICAL SCIENCE: ONLINE COURSE
SUBJECT: Functions of One Variable - TOPIC: Anti-Derivative

Integration:

(I) Indefine Integrals

(i) $\int (e^x f(x) + f'(x))dx = e^x f(x) + c$

(ii) $\int \frac{f'(x)}{f(x)}dx = \log|f(x)| + c$

(iii) $\int (f(x))^n f'(x)dx = \frac{(f(x))^{n+1}}{n+1} + c$

(iv) $\int uvdx = uv_1 - u'v_2 + u''v_3 - ...$

(v) $\int \log x dx = x\log x - x + c$

(vi) $\int \sin^{-1} x dx = x\sin^{-1} x + \sqrt{1-x^2} + c$

(vii) $\int \cos^{-1} x dx = x\cos^{-1} x - \sqrt{1-x^2} + c$

(viii) $\frac{1}{\sqrt{x^2-a^2}}dx = \cosh^{-1}\frac{x}{a} + c$

(ix) $\frac{1}{\sqrt{x^2+a^2}}dx = \sinh^{-1}\frac{x}{a} + c$

(II) Definite Integrals

(i) $\int_a^b f(x)dx = \int_a^b f(y)dy$

(ii) $\int_a^b f(x)dx = -\int_b^a f(x)dx$

(iii) $\int_a^b f(x)dx = \int_a^c f(x)dx + \int_c^b f(x)dx, a < c < b$

(iv) $\int_a^b f(x)dx = \int_a^b f(a+b-x)dx$

(v) $\int_0^a f(x)dx = \int_0^a f(a-x)dx$

(vi)

$$\int_{-a}^{a} f(x)dx = \begin{cases} 2\int_0^a f(x)dx & , f(-x) = f(x) \\ 0 & , f(-x) = -f(-x) \end{cases}$$

(vii)

$$\int_0^{2a} f(x)dx = \begin{cases} 2\int_0^a f(x)dx & , f(2a-x) = f(x) \\ 0 & , f(2a-x) = -f(x) \end{cases}$$