

③ Integration / Anti-derivation $\frac{d}{dx} f(x) = f'(x)$

$$\frac{d}{dx} \left(\frac{1}{6} x^6 \right) = \frac{1}{6} 6x^5 = x^5$$

(i) $\int x^n dx = \frac{x^{n+1}}{n+1}$, Power Rule

Q1:- $\int x^5 dx = \frac{x^{5+1}}{5+1} + C = \frac{x^6}{6} + C$

Q2:- $\int \frac{1}{\sqrt{x^3}} dx = \int x^{-\frac{3}{2}} dx = \frac{x^{-\frac{3}{2}+1}}{-\frac{3}{2}+1} = \frac{x^{-\frac{1}{2}}}{-\frac{1}{2}} = -\frac{2}{\sqrt{x}} + C$

Q3:- $\int \frac{1}{(2x+3)^4} dx = \int (2x+3)^{-4} dx = \int \frac{1}{2} (2x+3)^{-4} \frac{d}{dx} (2x+3) dx$
 $= \frac{1}{2} \frac{(2x+3)^{-3}}{-3} + C = -\frac{1}{6(2x+3)} + C$

Q4:- $\int \cos 2x dx = \frac{1}{2} \int \cos 2x (2) dx = \frac{1}{2} \sin 2x + C$

Q5:- $\int \sin 3x dx = -\frac{1}{3} \cos 3x + C$

(ii) $\int [f(x) + g(x)] dx = \int f(x) dx + \int g(x) dx$ Sum rule

(iii) $\int [f(x) - g(x)] dx = \int f(x) dx - \int g(x) dx$ Difference rule

(iv) $\int a f(x) dx = a \int f(x) dx$

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

Q6:- $\int (x+1)(x-3) dx = \int (x^2 - 2x - 3) dx$ (by Exp.)

$\int x^2 dx - 2 \int x dx - 3 \int 1 dx$