



#### Indefinite Integrals Ex 19.12 Q6

Let  $I = \int \cos^7 x dx$ . Then

$$I = \int \cos^6 x \cos x dx$$

$$= \int (\cos^2 x)^3 \cos x dx$$

$$= \int (1 - \sin^2 x)^3 \cos x dx$$

$$= \int [1 - \sin^6 x - 3 \sin^2 x + 3 \sin^4 x] \cos x dx$$

$$= \int [\cos x - \sin^6 x \cos x - 3 \sin^2 x \cos x + 3 \sin^4 x \cos x] dx + c$$

$$\Rightarrow I = \int \cos x dx - \int \sin^6 x \cos x dx - 3 \int \sin^2 x \cos x dx + 3 \int \sin^4 x \cos x dx$$

Putting  $\sin x = t$  and  $\cos x dx = dt$  in 2nd and 3rd and 4th integral, we get

$$I = \int \cos x dx - \int t^6 dt - 3 \int t^2 dt + 3 \int t^4 dt$$

$$= \sin x - \frac{t^7}{7} - \frac{3}{3} t^3 + \frac{3}{5} t^5 + c$$

$$= \sin x - \frac{1}{7} \sin^7 x - \sin^3 x + \frac{3}{5} \sin^5 x + c$$

$$\therefore I = \sin x - \sin^3 x + \frac{3}{5} \sin^5 x - \frac{1}{7} \sin^7 x + c$$

#### Indefinite Integrals Ex 19.12 Q7

Let  $I = \int x \cos^3 x^2 \sin x^2 dx$

Let  $\cos x^2 = t$ . Then

$$d(\cos x^2) = dt$$

$$\Rightarrow -2x \sin x^2 dx = dt$$

$$\Rightarrow x \sin x^2 dx = -\frac{dt}{2}$$

$$\therefore I = \int t^3 \times \frac{-dt}{2}$$

$$= -\frac{t^4}{8} + c$$

$$= -\frac{1}{8} \cos^4 x^2 + c$$

$$\therefore I = -\frac{1}{8} \cos^4 x^2 + c$$

#### Indefinite Integrals Ex 19.12 Q8

Let  $I = \int \sin^7 x dx$ . Then

$$\begin{aligned} I &= \int \sin^6 x \sin x dx \\ &= \int (\sin^2 x)^3 \sin x dx \\ &= \int (1 - \cos^2 x)^3 \sin x dx \\ &= \int (1 - \cos^6 x + 3 \cos^4 x - 3 \cos^2 x) \sin x dx \end{aligned}$$

$$\Rightarrow I = \int \sin x dx - \int \cos^6 x \sin x dx + 3 \int \cos^4 x \sin x dx - 3 \int \cos^2 x \sin x dx$$

Putting  $\cos x = t$  and  $-\sin x dx = dt$  in 2nd, 3rd and 4th integral, we get

$$\begin{aligned} I &= \int \sin x dx - \int t^6 (-dt) + 3 \int t^4 (-dt) - 3 \int t^2 (-dt) \\ &= -\cos x + \frac{t^7}{7} - \frac{3}{5} t^5 + \frac{3}{3} t^3 + C \end{aligned}$$

$$= -\cos x + \frac{\cos^7 x}{7} - \frac{3}{5} \cos^5 x + \cos^3 x + C$$

$$\therefore I = -\cos x + \cos^3 x - \frac{3}{5} \cos^5 x + \frac{1}{7} \cos^7 x + C$$

Indefinite Integrals Ex 19.12 Q9

Let  $I = \int \sin^3 x \cos^5 x dx$ . Then

Let  $\cos x = t$ . Then

$$d(\cos x) = dt$$

$$\Rightarrow -\sin x dx = dt$$

$$\Rightarrow dx = \frac{-dt}{\sin x}$$

$$\therefore I = \int \sin^3 x t^5 \frac{-dt}{\sin x}$$

$$= -\int \sin^2 x t^5 dt$$

$$= -\int (1 - \cos^2 x) t^5 dt$$

$$= -\int (1 - t^2) t^5 dt$$

$$= -\int (t^5 - t^7) dt$$

$$= -\frac{t^6}{6} + \frac{t^8}{8} + C$$

$$= -\frac{1}{6} \cos^6 x + \frac{1}{8} \cos^8 x + C$$

$$\therefore I = -\frac{1}{6} \cos^6 x + \frac{1}{8} \cos^8 x + C$$

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