19/MHS01/118

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Dpt : Medicine and surgery.

1. $\int \sin x \, dx$

solution

$\int \sin^6 x \, dx = \int (\sin^2 x) \, dx$

$= \int \left[\frac{1 - 2\cos 2x}{2} \right]^3 dx$

$= 1/8 \int (1 - 2\cos 2x)^3 = \frac{1}{8} \int (1 - 2\cos 2x)^2 (1 - 2\cos 2x) dx$

$= \frac{1}{8} \int (1 - 4\cos 2x + 4\cos^2 2x)(1 - 2\cos 2x) dx$

$= 1/8 \int (1 - 6\cos 2x + 12\cos^2 2x - 8\cos^3 2x] dx$

$= 1/8 \int [1 - 6\cos 2x + 12\left(\frac{1+\cos 4}{2}\right) - 8\cos^2 2x] dx$

$= 1/8 \left[\int dx - 6\int (1 + \cos 4x) dx - 8\int \cos^2 2x \, dx\right]$

but $\int \cos^3 2x \, dx = \int \cos^2 2x \cdot \cos 2x \, dx$

$= \int \frac{\cos 2x \, (1 + \cos 4x)}{2} dx$

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$$dx = -\frac{du}{\sin x}$$

$$\int \cos^4 x \sin^3 x \, dx = \int \cos^4 x$$

$$= \int \cos^4 x \sin x \cdot \sin^2 x \, dx$$

$$= \int \cos^4 x \sin x (1 - \cos^2 x) dx$$

$$= \int u^4 \sin x (1 - u^2) - \frac{du}{\sin x}$$

$$= -\int u^4 (1 - u^2) du$$

$$= -\int (u^4 - u^6) du$$

$$= -\left[\frac{u^5}{5} - \frac{u^7}{7}\right] + c$$

$$= \frac{-u^5}{5} + \frac{u^7}{7} + c$$

$$\therefore \int \cos^4 x \sin^3 x \, dx = \frac{\cos^7 x}{7} - \frac{\cos^5 x}{5} + c$$

3. $\int \cos x \sin x \, dx$

<u>solution</u>

$$, u = \cos x \quad , \frac{du}{dx} = -\sin x \quad , dx = \frac{-du}{\sin x}$$

$$\int \cos x \sin^3 x \, dx = \int \cos x \cdot \sin x (1 - \cos^2 x) \frac{-du}{\sin x}$$

$$= -\int u (1 - u^2) du$$

$$= -\int (u - u^3) du = \int (u^3 - u) du$$

$$= u^4/4 - u^2/2 + c$$

$$\therefore \int \cos x \sin^3 x \, dx = \frac{\cos^4 x}{4} \quad \frac{\cos^2 x}{2} + c$$

$$\int \cos x \sin^3 x \, dx = \frac{\cos^4 x}{4} - \frac{\cos^2 x}{2} + c$$