Igwe, Diana-Praise Chinaecherem.
MBBS
Mths
19/MHsd/197

Maths Assignment

1 $\sin^6 x$

$$\sin^6 x = (\sin^2 x)^2 (\sin^2 x)$$
$$= \left(\frac{1 - \cos 2x}{2}\right)^2 \left(\frac{1 - \cos 2x}{2}\right)$$
$$= \frac{1}{8}(1 - 2\cos 2x + \cos^2 2x)(1 - \cos 2x$$
$$= \frac{1}{8}\left(1 - 2\cos 2x + \frac{1 + \cos 4x}{2}\right)(1 - \cos 2x)$$
$$= \frac{1}{16}(2 - 4\cos 2x + 1 + \cos 4x)(1 - \cos 2x)$$
$$= \frac{1}{16}(3 - 4\cos 2x + \cos 4x)(1 - \cos 2x)$$
$$= \frac{1}{16}(3 - 4\cos 2x + \cos 4x - 3\cos 2x + 4\cos^2 2x - \cos 4x \cos 2x]$$
$$= \frac{1}{16}[3 - 7\cos 2x + \cos 4x + 2(2\cos^2 2x) - \tfrac{1}{2}(2\cos 4x \cos 2x)]$$
$$= \frac{1}{16}[3 - 7\cos 2x + \cos 4x + 2(1 + \cos 4x) - \tfrac{1}{2}(\cos 6x + \cos 2x)]$$
$$= \frac{1}{16}[3 - 7\cos 2x + \cos 4x + 2 + 2\cos 4x - \tfrac{1}{2}(\cos 6x + \cos 2x)]$$
$$= \frac{1}{32}[6 - 14\cos 2x + 2\cos 4x + 4 + 4\cos 4x - \cos 6x - \cos 2x]$$
$$= \frac{1}{32}[10 - 15\cos 2x + 6\cos 4x - \cos 6x]$$

Let $\sin^6 x = R$

$$R = \frac{1}{32}\int (10 - 15\cos 2x + 6\cos 4x - \cos 6x)\,dx$$

$$R = \frac{1}{32}\left(10x - \frac{15\sin 2x}{2} + \frac{6\cos 4x}{4} - \frac{\cos 6x}{6}\right) + C$$

$$\sin^6 x = \frac{10x}{32} - \frac{15\sin 2x}{64} + \frac{6\cos 4x}{128} + C$$

2 $\cos^4 x \sin^3 x$

$u = \cos x$

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

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

$\sin^2 x = 1 - \cos^2 x$

$\sin^2 x = 1 - u^2$

$$\int \cos^4 x \sin^3 x = \int \cancel{\sin x} \cdot \sin^2 x \, u^4 \frac{-du}{\cancel{\sin x}}$$

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

$= -\int u^4 - u^6 \, du$

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

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

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

$$\int \cos^4 x \sin^3 x = \frac{(\cos x)^7}{7} - \frac{(\cos x)^5}{5} + C$$

3 $\cos x \sin$

$\int \sin^3 x$

Let

$\frac{du}{dx}$

du

with

$\int \sin^3$

$= \int$

Using

$\int u^3 du$

hen

$\int \sin^3$

3. $\cos x \sin^3 x$

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

Let $u = \sin x$

$$\frac{du}{dx} = \cos x$$

$du = \cos x \, dx$

with this substitution

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

$$= \int u^3 \, du$$

Using reverse power rule

$$\int u^3 \, du = \frac{u^{3+1}}{3+1} + C = \frac{u^4}{4} + C$$

hence, $u = \sin x$

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