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MATRIC NUMBER: 19/MHS01/132

DEPARTMENT: MBBS

COURSE: MAT 104

ASSIGNMENT

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

Solution

$= \left(\frac{1 - \cos 2x}{2}\right)^2 \left[\frac{1 - \cos 2x}{2}\right]$

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

$= \frac{1}{8}\left[1 - 2\cos 2x + \frac{1 + \cos 4x}{2}\right](1 - \cos 2x)$

$= \frac{1}{16}(2 - 4\cos 2x + 1 + \cos 4x)(1 - \cos 2x)$

$= \frac{1}{16}(3 - 4\cos 2x + \cos 4x)(1 - \cos 2x)$

$= \frac{1}{16}(3 - 4\cos 2x + \cos 4x - 3\cos 2x +$

$4\cos^2 2x - \cos 4x \cos 2x)$

$= \frac{1}{16}[3 - 7\cos 2x + \cos 4x + 2(2\cos^2 2x)$

$- \frac{1}{2} \cdot 2\cos 4x \cos 2x$

$$= \frac{1}{16}\left(3 - 7\cos 2x + \cos 4x + 2(1 + \cos 4x)\right.$$

$$\left. - \frac{1}{2}(\cos 6x + \cos 2x)\right]$$

$$= \frac{1}{16}\left[3 - 7\cos 2x + \cos 4x + 2 + 2\cos 4x -\right.$$

$$\left.\frac{1}{2}(\cos 6x + \cos 2x)\right]$$

$$= \frac{1}{32}\left[6 - 14\cos 2x + 2\cos 4x + 4 +\right.$$

$$\left.4\cos 4x - \cos 6x - \cos 2x\right]$$

$$= \frac{1}{32}\left[10 - 15\cos 2x + 6\cos 4x - \cos 6x\right]$$

let $\sin^6 x = R$

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

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

$$\int \sin^6 x = \frac{10x}{32} - \frac{15\sin 2x}{64} + \frac{6\cos 4x}{128} - \frac{\cos 6x}{192} + C$$

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

Solution

$\cos^4 x \sin^3 x = \int \cos^4 x . \sin^2 x \sin x \, dx$

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

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

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

let $u = \cos x$

$du = -\sin x \, dx$

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

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

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

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

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

Solution

let $u = \sin x$

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

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

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

$\therefore \int \cos x \sin^3 x \, dx = \int u^3 \, du$

$= \frac{u^4}{4} + C$

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