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19/MHS01/102 MAT104 MBBS

Assignment

Question 1.

~~####~~ $\sin^6 x = (\sin^2 x)^2 (\sin^2 x)$

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

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

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

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

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

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

$= \frac{1}{16}\left[3-7\cos 2x+\cos 4x+2(1+\cos 4x)-\frac{1}{2}(\cos 6x+\cos 2x)\right]$

$= \frac{1}{16}\left[3-7\cos 2x+\cos 4x+2+2\cos 4x-\frac{1}{2}(\cos 6x+\cos 2x)\right]$

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

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

Let $\sin^6 x = R$

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

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

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

Question 2

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

Let $u = \cos x$, $du = -\sin x \, dx$

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

solution.

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

$-\int u^4 \sin^2 x$

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

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

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

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

$\frac{u^7}{7} - \frac{u^5}{5}$

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

Question 3

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

Solution

Let $u = \sin x$

$du = \cos x \, dx$

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

$$\int \cancel{\cos x} \cdot u^3 \frac{du}{\cancel{\cos x}}$$

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

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

$$= \frac{\sin^4 x}{4} + C$$

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