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COURSE: MAT104

DEPARTMENT: MBBS/MHS

MATIONS

) $\sin^6 x$

$= \int \sin^2 x \times (\sin^2 x)^2$

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

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

$= \frac{1}{8}\int 1-2\cos 2x+\cos^2 2x-\cos 2x+2\cos^2 2x\cos^3 2x\,dx$

$\frac{1}{8}\int 1-3\cos 2x+3\cos^2 2x-\cos^3 2x-\cos^3 2x\,dx$

$\frac{1}{8}\int 1-3\cos 2x+3\left[\frac{1+\cos 4x}{2}\right]-\cos^3 2x$

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

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

$u = \sin 2x \quad \frac{du}{dx} = 2\cos 2x \quad dx = \frac{du}{2\cos 2x}$

$\int \cos 2x - \cos 2x \cdot \sin^2 x \cdot \frac{du}{2\cos 2x}$

$\frac{1}{2}\int \cos 2x - \int u^2 du$

$\frac{\sin 2x}{4} - \frac{\sin 2x}{6} + C$

$= \frac{1}{8}\int 1-3\cos 2x+3\left[\frac{1+\cos 4x}{2}\right] - \frac{1}{2}\left[\cos 2x - u^2 du\right.$

$$\frac{1}{8}\left[\frac{5x}{2} - \frac{3\sin 2x}{2} + \frac{3\sin 4x}{8} - \frac{\sin 2x}{4} + \frac{\sin^3 2x}{6} + \right.$$

$$= \frac{5x}{16} - \frac{3\sin 2x}{16} + \frac{3\sin 4x}{64} - \frac{\sin 2x}{32} + \frac{\sin^3 2x}{48} + C$$

2) $\cos^4 x \sin^3 x \longrightarrow \int \cos^4 x \sin^3 x \rightarrow \int \sin^3 x \cos^4 x$

Sol

m is odd,

$\therefore u = \cos x$

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

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

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

$$\int \sin x \cdot \sin^2 x \cdot u^4 \cdot \frac{-du}{\sin x}$$

$$-\int \sin^2 x \cdot u^4 \, du$$

$$-\int (1 - \cos^2 x) \cdot u^4 \, du.$$

recall $u = \cos x$

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

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

$$(u^6 - u^4) \, du$$

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

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

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

$u = \sin x$

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

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

$\cos x \cdot \sin x \cdot \sin^2 x$

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

$\cos x \sin^3 x \frac{du}{\cos x}$

$= u^3 du$

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

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