31/05/2020 Math 102

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19/MHS01/332
MBBS

1) $\int \sin^6 x\,dx$

$\int (\sin^2 x)^3\,dx$

$\int \left(\frac{1-\cos 2x}{2}\right)^3$

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

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

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

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

$\frac{1}{8}\left(x-\frac{3\sin 2x}{2}+\frac{3\sin 4x+12x}{8}-\frac{3\sin 2x-3\sin^3 2x}{8}\right.$

$\frac{x}{8}-\frac{3\sin 2x}{16}+\frac{3\sin 4x+12x}{64}-\frac{3\sin 2x-3\sin^3 2x}{16}+C$

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

$u=\cos x$

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

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

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

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

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

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

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

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

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

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

$u=\sin x$

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

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

$\int u^3 \, du$

$\frac{u^4}{4}+c$

$\#\cos x \sin^3 x = \frac{\sin^4 x}{4}+c$