ERADAJAYE VICTOR MUDIAGA

19/MHS01/103

Math 104

1 ~~Sin6x~~

$\sin^6 x$

$$\int \sin^6 x\,dx = \int \sin^2 x \cdot \sin^4 x$$

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

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

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

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

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

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

$$= \frac{1}{8}\int 1-3\cos 2x + \frac{3}{2} + \frac{3\cos 4x}{2} - \cos 2x + \cos 2x \sin^2 2x$$

$$= \frac{1}{8}\int \frac{5}{2} - 4\cos 2x + \frac{3\cos 4x}{2} + \cos 2x \sin^2 2x$$

$$= \frac{1}{8}\left[\frac{5}{2}x - \frac{\cancel{4}\sin 2x}{\cancel{2}} + \frac{3\cos 4x}{8} + \frac{\sin^3 2x}{6}\right] + C$$

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

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

$u = \cos x$

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

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

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

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

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

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

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

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

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

$u = \sin x$

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

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

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

$$= \int u^3 du$$

$$= \left[\frac{u^4}{4}\right] + C$$

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

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