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MATRIC NO: 19/MH501/038

DEPARTMENT: MEDICINE AND
SURGERY,

$$\int \sin^6 x = \int (\sin^2 x)^3$$

$$\int \sin^6 x = \int (\sin^2 x)^2 \sin^2 x$$

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

$$\int \sin^6 x = \frac{1}{8} \int (1 - 2\cos 2x + \cos^2 2x)(1 - \cos 2x)$$

$$\int \sin^6 x = \frac{1}{8} \int (1 - 2\cos 2x + \cos^2 2x - \cos 2x + 2\cos^2 2x - \cos^3 2x)$$

$$\int \sin^6 x = \frac{1}{8} \int (1 - 3\cos 2x + 3\cos^2 2x - \cos^3 2x)$$

$$\int \sin^6 x = \frac{1}{8} \int \left(1 - 3\cos 2x + 3 \left(\frac{1 + \cos 4x}{2} \right) - (\cos^2 2x) \cos 2x \right)$$

$$\int \sin^6 x = \frac{1}{8} \int \left(1 - 3\cos 2x + \frac{3}{2} + \frac{3\cos 4x}{2} - \left((1 - \sin^2 2x) \cos 2x \right) \right)$$

$$\int \sin^6 x = \frac{1}{8} \int \left(\frac{5}{2} - 3\cos 2x + \frac{3\cos 4x}{2} - \left((1 - \sin^2 2x) \cos 2x \right) \right)$$

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

$$\int \sin^6 x = \frac{1}{8} \int \left(\frac{5x}{2} - \frac{3\sin 2x}{2} + \frac{3\sin 4x}{8} - \left((1 - u^2) \cos 2x \frac{du}{2\cos 2x} \right) \right)$$

$$\int \sin^6 x = \frac{1}{8} \int \left(\frac{5x}{2} - \frac{3\sin 2x}{2} + \frac{3\sin 4x}{8} - \left(\frac{1 - u^2}{2} du \right) \right)$$

$$\int \sin^4 x = \frac{1}{8} \left(\frac{5x}{2} - \frac{5\sin 2x}{2} + \frac{3\sin 4x}{8} - \left(\frac{4-u^3}{2} \right) \right) + C$$

since $u = \sin 2x$

$$\int \sin^4 x = \frac{1}{8} \left(\frac{5x}{2} - \frac{5\sin 2x}{2} + \frac{3\sin 4x}{8} - \frac{\sin 2x}{2} + \frac{\sin^3 2x}{6} \right) + C$$

~~$$\frac{5x}{16} - \frac{5\sin 2x}{16} + \frac{3\sin 4x}{64}$$~~

$$\int \sin^4 x = \frac{1}{16} \left(5x - 5\sin 2x + \frac{3\sin 4x}{4} - \frac{\sin 2x + \sin^3 2x}{2} \right) + C$$

$$\int \sin^4 x = \frac{1}{16} \left(5x - 4\sin 2x + \frac{3\sin 4x}{4} + \frac{\sin^3 2x}{2} \right) + C$$

② $\int \cos^4 x \sin^3 x = \text{let } u = \cos x \quad \frac{du}{dx} = -\sin x \quad dx = \frac{du}{-\sin x}$

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

$$\int \cos^4 x \sin^3 x = - \int u^4 \sin^2 x \, du$$

$$\int \cos^4 x \sin^3 x = - \int u^4 (1 - \cos^2 x) \, du = - \int u^4 (1 - u^2) \, du$$

$$\int \cos^4 x \sin^3 x = - \int u^4 - u^6 \, du = \int u^6 - u^4 \, du$$

$$\int \cos^4 x \sin^3 x = \left[\frac{6u^7}{7} - \frac{u^5}{5} \right] + C$$

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

$$\textcircled{3} \int \cos x \sin^3 x = \text{let } u = \cos x$$
$$\frac{du}{dx} = -\sin x \quad dx = \frac{du}{-\sin x}$$

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

$$\int \cos x \sin^3 x = - \int u \sin^2 x \, du$$
$$= - \int u(1 - \cos^2 x) \, du$$

$$\int \cos x \sin^3 x = - \int u(1 - u^2) \, du$$

$$\int \cos x \sin^3 x = - \int u - u^3 \, du$$
$$= - \left[\frac{u^2}{2} - \frac{u^4}{4} \right]$$

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

$$\frac{\cos^4 x}{4} - \frac{\cos^2 x}{2} + C$$