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19/MATHS01/276

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

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

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



# PROBLEM 11

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

since  $u = \sin 2x$

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

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

$$\int \sin^6 x = \frac{1}{16} \left( 5x - 3\sin 2x + \frac{3\sin 4x}{4} - \frac{\sin 2x}{2} + \frac{\sin^3 2x}{3} \right) + C$$

$$\int \sin^6 x = \frac{1}{16} \left( 5x - 4\sin 2x + \frac{3\sin 4x}{4} + \frac{\sin^3 2x}{3} \right) + C$$

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

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

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

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

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

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

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



$$\textcircled{3} \int \cos x \sin^3 x = \text{let } u = \cos x$$

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

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

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

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

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

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

$$= - \left[ \frac{u^2}{2} - \frac{u^4}{4} \right]$$

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

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