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 Matric No: 19/MHSD/1167.

$$\textcircled{1} \int \sin^6 x \, dx$$

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

$$\int \sin^6 x = \int \frac{1 - \cos 2x}{2} \cdot \left(\frac{1 - \cos 2x}{2} \right)^2 dx$$

$$\int \sin^6 x = \int \frac{1 - \cos 2x}{2} \times \frac{1 - 2\cos 2x + \cos^2 2x}{4} dx$$

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

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

$$\int \sin^6 x = \frac{1}{8} \int 1 - 3\cos 2x + \frac{3}{2} + \frac{3\cos 4x}{2} - \cos 2x + \cos 2x \sin^2 2x \, dx$$

$$\int \sin^6 x = \frac{1}{8} \int \frac{5}{2} - 4\cos 2x + \frac{3\cos 4x}{2} + \cos 2x \sin^2 2x \, dx$$

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

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

$$\text{Let } u = \cos x$$

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

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

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

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

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

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

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

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

$$u = \sin x$$

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

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

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

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

$$\int \cos x \sin^3 x \, dx = \frac{u^4}{4} + C = \frac{\sin^4 x}{4} + C.$$