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19/MHS01/025

MBBS

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

$$= -\frac{1}{6} \times \sin x^5 \cos x + \frac{5}{6} \int \sin x^4 dx$$

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

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

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

$$= \frac{\sin x^5 \cos x}{6} - \frac{5 \sin x^3 \cos x}{24} - \frac{5}{16} \times \frac{5 \sin 2x + 6}{32}$$

$$2 \int \cos^5 x \sin^3 x dx$$

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

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

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

$$= -\frac{\cos^5 x}{5} + \frac{\cos^7 x}{7}$$

$$= -\frac{\cos^5 x}{5} + \frac{\cos^7 x}{7} + C$$

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

$$= \int u^3 \, dx$$

$$= \frac{u^4}{4}$$

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

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