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19/MH501/405
Medicine and Surgery

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

Using reduction formula

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

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

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

$= -\frac{1}{6} \sin^5 x \cos x - \frac{5}{24} \sin^3 x \cos x + \frac{5}{8} \left[-\frac{1}{2} \sin x \cos x + \frac{1}{2} \int \sin^0 x' \right.$

$-\frac{1}{6} \sin^5 x \cos x - \frac{5}{24} \sin^3 x \cos x - \frac{5}{16} \sin x \cos x + \frac{5}{16} x + C$

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

$\int \sin x \sin^2 x (\cos^2 x)^2 dx$

$\int \sin x [1 - \cos^2 x] (\cos^2 x)^2 dx$

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

$-\int \cancel{\sin x} [1 - \cos^2 x] (\cos^2 x)^2 \frac{du}{\cancel{\sin x}}$

$-\int [1 - u^2] [u^2]^2 du$

$-\int [1 - u^2 [u^4] du$

$-\int [u^4 - u^6] du$

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

$= -\frac{1}{5} \cos^5 x + \frac{1}{7} \cos^7 x + C$

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

$\int \cos x \sin x \sin^2 x \, dx$

$\int \sin x (1 - \cos^2 x) \cos x \, dx$

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

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$$-\int \cancel{\sin x}\,[1-u^2]u \cdot \frac{du}{\cancel{\sin x}}$$

$$-\int [1-u^2]u \cdot du$$

$$-\int [u - u^3]\, du$$

$$-\frac{u^2}{2} + \frac{u^4}{4} + C$$

$$-\frac{1}{2}\cos^2 x + \frac{1}{4}\cos^4 x + C$$