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1.) $x^{1/2} \ln x$

let $u = \ln x$

and $dv = x^{1/2}$

therefore using the formular

$$\int u\,dv = uv - \int v\,du$$

let $\frac{du}{dx} = \frac{1}{x}$

$du = \frac{dx}{x}$ or $du = \frac{1}{x}(dx)$

then $\int dv = \frac{2x^{3/2}}{3}$ $\therefore v = \frac{2x^{3/2}}{3}$

$$\ln x \cdot \frac{2x^{3/2}}{3} - \int \frac{2x^{3/2}}{3} \times \frac{dx}{x}$$

$$\ln x \cdot \frac{2x}{3} - \frac{4x^{7/2}}{35} \cdot \ln + C_{11}$$

2) $\int 2\cos 6t \cos t$

$2\int \cos 6t \cos t$

$= \frac{1}{2}\left[\cos(6t+t) + \cos(6t-t)\right]$

$= \frac{1}{2}\cos 7t + \cos 5t$

$= \cancel{2}\int \frac{1}{\cancel{2}}$ $\quad 2\times\frac{1}{2}\int \cos 7t + \cos 5t$

$1\left[\frac{\sin 7t}{7} + \frac{\sin 5t}{5}\right] + c.$

$\therefore \frac{\sin 7t}{7} + \frac{\sin 5t}{5} + c_{11}$

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

Solution:

$u = \cos x$

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

$\sin^2 x + \cos^2 = 1$

$\sin^2 x = 1 - \cos^2 x$

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

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

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

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

$= -\int (1 - u^2) u^4 \, du$

$= \int (u^2 - 1) u^4 \, du$

$= \int (u^6 - u^4) \, du$

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

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