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DEPARTMENT: COMPUTER ENGINEERING

$$1) x^{1/2} \ln x \quad dv = x^{1/2}$$
$$\text{let } u = \ln x \quad v = \frac{x^{3/2}}{3/2} = \frac{2x^{3/2}}{3}$$
$$du = \frac{1}{x} dx$$

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

$$= \frac{2x^{3/2} \ln x}{3} - \int \frac{2x^{3/2}}{3} \cdot \frac{1}{x} dx$$

$$= \frac{2x^{3/2} \ln x}{3} - \frac{2x^{3/2+1}}{3 \cdot \frac{3}{2} + 1} \cdot \ln x$$

$$= \frac{2x^{3/2} \ln x}{3} - \frac{2x^{5/2}}{3} \times \frac{2}{5} \cdot \ln x$$

$$= \frac{2x^{3/2} \ln x}{3} - \frac{2x^{5/2}}{3} \cdot \frac{2}{5} \cdot \ln x$$

$$\frac{2x^{3/2} \ln x}{3} - \frac{4x^{5/2}}{15} \cdot \ln x + C$$

$$\ln x \left[ \frac{2x^{3/2}}{3} - \frac{4x^{5/2}}{15} \right] + C$$

$$\begin{aligned}
 & \int 2 \cos t \cos t \\
 \cos A \cos B &= \frac{1}{2} [\cos(A+B) + \cos(A-B)] \\
 A &= t \quad B = t \\
 &= \frac{1}{2} [\cos 2t + \cos 0] \\
 &= \frac{1}{2} \left[ \frac{\sin 2t}{2} + \frac{\sin 0t}{5} \right] + C \\
 &= \frac{\sin 2t}{7} + \frac{\sin 0t}{5} + C
 \end{aligned}$$

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$$\begin{aligned}
 & \sin^3 x \cos^4 x \\
 \sin^2 x &= \sin x \cdot \sin x \\
 &= \int \sin x \sin^2 x \cos^4 x \, dx \\
 \sin^2 x &= 1 - \cos^2 x \\
 &= \int \sin x \cdot [1 - \cos^2 x] \cos^4 x \, dx \\
 \text{let } \cos x &= u \\
 du &= -\sin x \, dx \\
 &= \int \frac{1 - u^2}{5} \cdot u^4 \cdot \frac{-du}{\sin x} \\
 &= - \int (u^4 - u^6) \cdot du \\
 &= \frac{u^5}{5} - \frac{u^7}{7} + C
 \end{aligned}$$

$$= \frac{1}{7} \cos^7 x - \frac{1}{5} \cos^5 x + \frac{1}{3} \cos^3 x - \frac{1}{1} \cos x + C$$

$$\cos(A+B) = \cos A \cos B - \sin A \sin B$$

$$A = C, B = x$$

$$\cos(C+x) = \cos C \cos x - \sin C \sin x$$

$$\frac{1}{2} \left[ \cos(C+x) + \cos(C-x) \right] = \frac{1}{2} \left[ \cos C \cos x - \sin C \sin x + \cos C \cos x + \sin C \sin x \right]$$

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

$$\cos^2 x = \frac{1}{2} (1 + \cos 2x)$$

$$\cos^3 x = \cos x \cdot \cos^2 x = \cos x \cdot \frac{1}{2} (1 + \cos 2x)$$

$$= \frac{1}{2} \cos x + \frac{1}{2} \cos x \cos 2x$$

$$= \frac{1}{2} \cos x + \frac{1}{4} (\cos 3x + \cos x)$$