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MAT NO: 19/ENG03/012.

ANSWERS.

1. $\int x^{\frac{1}{2}} \ln x \, dx$

let $v = \ln x$ $du = x^{\frac{1}{2}} dx$

$dv = \frac{dx}{x}$; $u = \frac{2x^{3/2}}{3}$

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

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

$\int \frac{2x^{\frac{1}{2}}}{3} \cdot \frac{dx}{x} \Rightarrow \int \frac{2x^{\frac{1}{2}}}{3} dx$

$\int \frac{2x^{\frac{1}{2}}}{3} \cdot dx = \frac{4x^{\frac{3}{2}}}{9} + C$

$\int x^{\frac{1}{2}} \ln x \, dx = \frac{2x^{\frac{3}{2}}}{3} \ln x - \frac{4x^{\frac{3}{2}}}{9} + C$

2. $\int 2\cos 6t \cos t \, dt$, let $A = 6t$ $B = t$

$\cos A \cos B = \frac{1}{2}[\cos(A+B) + \cos(A-B)]$

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

$= \int \cos 7t + \cos 5t$

$\int 2\cos 6t \cos t = \frac{\sin 7t}{7} + \frac{\sin 5t}{5} + C$

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

Since m is odd, $u = \cos x$

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

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

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

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

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

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

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

$$\Rightarrow \left[\frac{u^7}{7} - \frac{u^5}{5} \right] + C$$

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

$$\int \sin^3 x \cos^4 x \, dx = \frac{(\cos x)^7}{7} - \frac{(\cos x)^5}{5} + C.$$