NAME: UDECHUKWU CHINONSO IFENNA
DEPT: COMPUTER ENGINEERING
MATRIC NO: 19/ENG02/067

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

$u = \ln x \qquad dv = x^{1/2}$

$\frac{du}{dx} = \frac{1}{x} \qquad v = \frac{x^{3/2}}{3/2}$

$du = \frac{dx}{x} \qquad v = \frac{2x^{3/2}}{3}$

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

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

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

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

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

$= 2x^{3/2} \ln x - \frac{4x^{3/2}}{9} + C$

2. $\int 2 \cos 6t \cos t \, dt$

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

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

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

$= \frac{\sin 7t}{7} + \frac{\sin 5t}{5} + C$

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

$u = \cos x$

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

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

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

$$\int u^4 \cdot \sin^3 x \cdot \frac{-dy}{\sin x}$$

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

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

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

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

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

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

$u = \cos x$

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

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

$$-\left[\frac{u^{4+1}}{4+1} - \frac{u^{6+1}}{6+1} \right] + c$$

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

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

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

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