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Dep: Computer engineering

Course: Maths 104

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

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

3)  $3 \sin^3 x \cos 4x$

Solu

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

$$\int x^{1/2} \ln x$$

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

$$\frac{du}{dx} = \frac{1}{2} x^{-1/2}$$

$$\int v \frac{du}{dx} + \int u \frac{dv}{dx}$$

$$\ln x \int dx x^{1/2} + x^{1/2} \int \frac{dx}{x}$$

$$\ln x \left[ \frac{x^{3/2}}{3/2} \right] + x^{1/2} \left[ \frac{1}{x} \right] + C$$

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

$$\frac{2 x^{3/2} \ln x}{3} + \frac{\sqrt{x}}{x} + C$$

2)  $\int 2 \cos 6t \cos t dt = 12 \int \cos 6t \cos t dt$

$$A = 6t \quad B = t$$

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

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

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

$$\int 2 \cos 6t \cos t dt = \frac{1}{2} [2 \cos 7t + 2 \cos 5t]$$

$$= \left[ \frac{\sin 7t}{7} - \frac{\sin 5t}{5} \right]$$

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

a)  ~~$\int \sin^3 x \cos^4 x$~~

b)  $\int \sin^3 x \cos^4 x dx$

$u = \cos x$

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

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

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

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

Recall that

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

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

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

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

but  $u = \cos x$

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

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

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

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

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

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