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MATRIC NUMBER: 19/MHS01/132

DEPARTMENT: MBBS

COURSE: MAT 104{GENERAL MATHEMATICS II}

ASSIGNMENT

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ASSIGNMENT

1) $\int 2x^2 \ln x$

let $u = \ln x$

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

$\frac{dv}{dx} = 2x^2$

$v = \int 2x^2 = \frac{x^3}{3}$

$\Rightarrow \int 2x^2 \ln x = 2\int x^2 \ln x\,dx$

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

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

$= 2\left[\frac{x^3 \ln x}{3} - \int \frac{x^2}{3}\right]dx$

$= 2\left[\frac{x^3 \ln x}{3} - \frac{1}{3}\int x^2\right]dx$

$= 2\left[\frac{x^3 \ln x}{3} - \frac{1}{3} \cdot \frac{x^3}{3}\right]dx$

$= 2\left[\frac{x^3 \ln x}{3} - \frac{x^3}{9}\right]dx$

$= \frac{2x^3 \ln x}{3} - \frac{2x^3}{9}\,dx$

$= \frac{3 \times 2x^3 \ln x - 2x^3}{9}\,dx$

$= \frac{2x^3(3\ln x - 1)}{9} + C$

$= \frac{2x^3(3\ln x - 1)}{9} + C$

$\therefore \int 2x^2 \ln x =$

$\frac{2x^3(\ln x - 1)}{3} + C$

2) $\int 3t\, e^{2t}\, dt$

let $u = 3t$

$\frac{du}{dx} = 3$

$\frac{dv}{dt} = e^{2t}$

$v = \int e^{2t} = \frac{1}{2} e^{2t}$

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

$\int 3t e^{2t} dt = \left[3t \cdot \frac{1}{2} e^{2t} - \int \frac{1}{2} e^{2t} \cdot 3\right] dx$

$\int 3t e^{2t} dt = \left[\frac{3te^{2t}}{2} - \frac{1}{4} e^{2t} \cdot 3\right]$

$\int 3t e^{2t} dt = \left[\frac{3te^{2t}}{2} - \frac{3e^{2t}}{4}\right] dt$

$\int 3t e^{2t} dt = \frac{3te^{2t}}{2} - \frac{3e^{2t}}{4} + C$

3) $\int x^2 \sin x$

let $u = x^2$

$\frac{du}{dx} = 2x$

$\frac{dv}{dx} = \sin x$

$v = \int \sin x = -\cos x$

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

$\int x^2 \sin x\, dx =$

$\left[\cancel{x^2 \cdot -\cos x} - \int -\cos x \cdot 2x\right]$

$\int x^2 \sin x\, dx =$

$\left[-x^2 \cos x - \int -2x \cos x\right] dx$

using Integration by parts

$u = x$ $\quad \frac{dv}{dx} = \cos x$

$\frac{du}{dx} = 1$ $\quad v = \sin x$

$\int x^2 \sin x\, dx =$

$\left[-x^2 \cos x + 2\int x \cos x\right]$

$\int x^2 \sin x\, dx =$

$\left[\int -x^2 \cos x + 2(x \sin x + \cos x\right] dx$

$= \left[(-x^2 \cos x + 2x \sin x + 2\cos x\right] dx$

$\int x^2 \sin x\,dx =$

$-x^2\cos x + 2x\sin x$
$+ 2\cos x + C$

$\int x^2 \sin x\,dx = (2 - x^2)\cos x + 2x\sin x + C$

4) $\int \cos 5x \cos 6x$

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

$A = 5x,\ B = 6x$

$= \frac{1}{2}\left[\cos(5x+6x) + \cos(5x-6x)\right]$

$= \frac{1}{2}\left[\cos 11x + \cos(-x)\right]$

$= \frac{1}{2}\left[\frac{-\sin 11x}{11} + \frac{\sin x}{1}\right]$

$= \frac{-\sin 11x}{22} + \frac{\sin x}{2} + C$

$\int \cos 5x \cos 6x$

$= \frac{-\sin 11x}{22} + \frac{\sin x}{2} + C$

5) $\int \sin 7x \cos 2x$

$A = 7x,\ B = 2x$

recall, $\sin A \cos B = \frac{1}{2}\left[\sin(A+B) + \sin(A-B)\right]$

$= \frac{1}{2}\left[\sin(7x+2x) + \sin(7x-2x)\right]$

$= \frac{1}{2}\left[\sin 9x + \sin 5x\right]dx$

$= \frac{1}{2}\left[-\cos 9x + (-\cos 5x)\right]$

$= \frac{1}{2}\left[\frac{-\cos 9x}{9} - \frac{\cos 5x}{5}\right]$

$= \frac{-\cos 9x}{18} - \frac{\cos 5x}{10} + C$

$\therefore \int \sin 7x \cos 2x = \frac{-\cos 9x}{18} - \frac{\cos 5x}{10} + C$