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MATRIC NO: 19/SCI01/087

ASSIGNMENT

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Department ⇒ Computer Science

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Assignment

1. $\sin 7x \cos 2x \, dx$

Solution

$\int \sin 7x \cos 2x \, dx$

Recall,

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

$A = 7x$ and $B = 2x$

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

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

$\int \sin 7x \cos 2x \, dx = \int \frac{1}{2}\left[\sin 9x + \sin 5x\right]$

$= \frac{1}{2}\int \sin 9x + \sin 5x$

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

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

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

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

2. $\cos 3x \cos x \, dx$

Solution

$\int \cos 3x \cos x \, dx$

Recall,

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

$A = 3x$ and $B = x$

$\cos A \cos B = \frac{1}{2}[\cos(3x+x) + \cos(3x-x)]$

$= \frac{1}{2}[\cos 4x + \cos 2x]$

$\int \cos 3x \cos x \, dx = \int \frac{1}{2}[\cos 4x + \cos 2x]$

$= \frac{1}{2}\int \cos 4x + \cos 2x$

$= \frac{1}{2}[\int \cos 4x + \int \cos 2x]$

$= \frac{1}{2}\left[\frac{\sin 4x}{4x} + \frac{\sin 2x}{2}\right]$

$= \frac{\sin 4x}{8} + \frac{\sin 2x}{4} + C$

3/ $\frac{\cos x}{\sin^2 x} dx$

solution

$\int \frac{\cos x}{\sin^2 x} dx$

let $u = \sin x$

$\frac{du}{dx} \times \cos x$

$du = \cos dx$

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

we have,

$\int \frac{\cos x}{\sin^2 x} dx = \int \frac{\cancel{\cos x}}{\sin^2 x} \times \frac{1}{\cancel{\cos x}} du = \int \frac{1}{\sin^2 x} du$

recall $u = \sin x$

$= \int \frac{1}{u^2} du = \int u^{-2} du$

$= \left[\frac{u^{-2+1}}{-2+1}\right] = \frac{u^{-1}}{-1} = -u^{-1}$

$= -\frac{1}{u} = -\frac{1}{\sin x}$

4 $\int_1^2 \left(\int_0^3 9x^2y\,dx\right) dy$

solution

$\int_0^3 9x^2y\,dx$

$= \left[3x^3y\right]_0^3 = 3(3)^3y - 3(0)^3y$

$= 81y$

$= \int_1^2 81y\,dy$

$= \left[\frac{81y^2}{2}\right]_1^2 = \frac{81(2)^2}{2} - \frac{81(1)^2}{2}$

$= \frac{324}{2} - \frac{81}{2} = \frac{324-81}{2} = \frac{243}{2} =$ ~~[illegible]~~

$= 121.50$ or $121\frac{1}{2}$