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MECHATRONICS ENGINEERING

19/ENG05/032

MAT 104

ASSIGNMENT FOR AR. OKELAMI'S GROUP

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

well first; $\sin a \cdot \cos b = \frac{1}{2}[\sin(a+b) + \sin(a-b)]$

$\sin 7x \cos 2x = \frac{1}{2}(\sin(7x+2x) + \sin(7x-2x))$

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

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

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

$= -\frac{1}{18}\cos 9x - \frac{1}{10}\cos 5x + C.$

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

Using, $\cos a \cdot \cos b = \frac{1}{2}(\cos(a+b) + \cos(a-b))$

$\cos 3x \cos x = \frac{1}{2}(\cos(3x+x) + \cos(3x-x))$

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

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

$= \frac{1}{2}\left(\frac{1}{2}\sin 2x\right) + \frac{1}{2}\left(\frac{1}{4}\sin 4x\right) + C$

$= \frac{1}{4}\sin 2x + \frac{1}{8}\sin 4x + C$

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

let $u = \sin x$

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

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

$= \int \frac{\cos x}{u^2} \cdot \frac{du}{\cos x}$

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

$= \int u^{-2} \cdot du$

$= \frac{u^{-1}}{-1}$

$= -\frac{1}{u} = \frac{-1}{\sin x} = -\operatorname{Cosec} x + c$

7) $\int_1^2 \int_0^3 9x^2 y \, dx \, dy$

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

$\left[\frac{9x^3}{3} y \right]_0^3$

$[3x^3 y]_0^3$

$[3(3)^3 y] - [3(0)^3 y]$

$= 81y - 0$

$= 81y$

$\int_1^2 (81y) \, dy$

$\left[\frac{81y^2}{2} \right]_1^2$

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

$= \frac{162}{1} - \frac{81}{2}$

$324 - \frac{81}{2} = 243/2$