

Name: Mathias Shatach Ojojobo

Dept: Mechanical Engineering

Maths: 19/ENG05/036

MAT 104

Assignment

Find the integral of the following

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

Solution

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

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

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

$$\sin A \cos B = \frac{1}{2} [\sin 9x + \sin 5x]$$

$$\int \sin 7x \cos 2x dx = \frac{1}{2} \int (\sin 9x + \sin 5x)$$

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

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

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

Solution

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

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

$$A = 3x, B = x$$

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

$$\int \cos 3x \cos x dx = \frac{1}{2} \int (\cos 4x + \cos 2x)$$

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

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

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

Solution

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

$$\text{Let } u = \sin x$$

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

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

$$\int \frac{du}{u^2} \quad ; \quad \int u^{-2} du$$

$$\frac{u^{-1}}{-1} + C$$

$$-u^{-1} + C$$

$$-\sin^{-1} x + C$$

$$4. \int_1^2 \left[ \int_0^3 9x^2 y dx \right] dy$$

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

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

$$= 3(3)^3 y$$

$$= 81y$$

$$\int_1^2 [81y] dy$$

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

$$= \frac{81(2)^2}{2} - \frac{81(1)^2}{2}$$

$$= 162 - 40.5$$

$$= 121.5$$