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Dept: microbiology

matric no: 19/SCIO51002

Course code: mat 104

mat 104 Assignment

$$1) \int e^x \sin x dx$$

$$u = \sin x, \quad du = \cos x dx$$

$$dv = e^x dx, \quad v = e^x$$

$$\int e^x \sin x dx = e^x \sin x - \int e^x \cos x dx$$

$$u = \cos x, \quad du = -\sin x dx$$

$$dv = e^x dx, \quad v = e^x$$

$$\int e^x \sin x dx = e^x \sin x - [e^x \cos x + \int e^x \sin x dx]$$

$$2 \int e^x \sin x dx = e^x \sin x - e^x \cos x - \int e^x \sin x dx + \int e^x \sin x dx$$

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

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

$$\int e^x \sin x dx = \frac{1}{2} (e^x \sin x - e^x \cos x) + C$$

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

Solution

$$u = \ln x, \quad dv = 2x^2 dx$$

$$\frac{du}{dx} = \frac{1}{x}, \quad v = \frac{x^3}{3}$$

$$dx = x du = \int u dv = uv - \int v du$$

$$\int \ln x \cdot 2x^2 dx = \ln x \cdot \frac{x^3}{3} - \int \frac{x^3}{3} \cdot \frac{1}{x} dx$$

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

$$= \ln x \left( \frac{x^3}{3} \right) - \int \frac{x^2}{3} dx \rightarrow \frac{1}{3} \int x^2$$

$$\Rightarrow \ln x \left( \frac{x^3}{3} \right) - \frac{x^3}{9} + C$$

$$3. \int x^2 \sin x dx$$

Solution

$$u = x^2, \quad dv = \sin x$$

$$\frac{du}{dx} = 2x \quad v = -\cos x$$

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

$$\int x \cos x dx$$

$$u = x, \quad \frac{dv}{dx} = \cos x \Rightarrow \frac{du}{dx} = 1, \quad v = \sin x$$

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

$$= x \sin x + \cos x$$

$$\Rightarrow \int x \cos x dx = x \sin x + \cos x$$

$$\Rightarrow -x^2 \cos x + 2[x \sin x + \cos x] + C$$

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

$$4. \int x \cos x dx$$

Solution

$$u = x, \quad dv = \cos x dx$$

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

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

$$\int x \cos x dx = x(\sin x) - \int \sin x dx$$

$$= x \sin x + \cos x + C$$