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M M B S

19/MHS01/180

MATH 101

ASSIGNMENT

1. Integrate  $2x^2 \ln x$

using integration by part formula

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

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

$$du = \frac{1}{x} dx \quad v = \frac{2x^3}{3}$$

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

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

$$\int 2x^2 \ln x = \left( \ln x \cdot \frac{2x^3}{3} \right) - \frac{2x^3}{9} + C$$

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

2. Integrate  $\frac{1}{x^2}$

2 Integras  $3te^{2t}$

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

$$u = 3t$$

$$dv = e^{2t}$$

$$du = 3 dt$$

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

$$\int 3te^{2t} = 3t \cdot \frac{e^{2t}}{2} - \int \frac{e^{2t}}{2} \cdot 3 dt$$

$$\int 3te^{2t} = 3t \cdot \frac{e^{2t}}{2} - \frac{3}{2} \int e^{2t} dt$$

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

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

3 Integras  $x^2 \sin x$

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

$$u = x^2$$

$$dv = \sin x$$

$$du = 2x dx$$

$$v = -\cos x$$

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

Using  $\int \cos x \cdot x dx$

$$u = x$$

$$dv = \cos x$$

$$du = dx$$

$$v = \sin x$$

$$\begin{aligned} \int \cos x \cdot x dx &= x \cdot \sin x - \int \sin x \cdot dx \\ &= x \sin x - (-\cos x) + C \end{aligned}$$

$$\int \cos x \cdot x dx = x \sin x + \cos x + C \dots +$$

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

4 Integrate  $\cos 5x \cos 6x$

$$\int \cos 5x \cos 6x dx = \frac{1}{2} \int (\cos(5x+6x) + \cos(5x-6x))$$

$$\int \cos 5x \cos 6x dx = \frac{1}{2} \int \cos 11x - \cos x$$

$$\int \cos 5x \cos 6x dx = \frac{1}{2} \left[ \frac{\sin 11x}{11} - \frac{\sin x}{1} \right] + C$$

$$\int \cos 5x \cos 6x dx = \frac{\sin 11x}{22} - \frac{\sin x}{2} + C$$

5 Integrate  $\sin 7x \cos 2x$

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

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

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

~~Integrate  $\sin 7x \cos 2x$~~