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Assignment

1 $2x^2 \ln x$

Solution

$$\int 2x^2 \ln x$$

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

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

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

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

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

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

$$2 \left(\ln(x) \times \frac{x^3}{3} - \frac{1}{3} \times \frac{x^3}{3} \right)$$

$$\frac{2x^3 \times \ln(x)}{3} - \frac{2x^3}{9}$$

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

2 $3te^{2t}$

Solution

$$\int 3te^{2t} dt$$

$$3 \times \int te^{2t} dt$$

$$3 \left(t \times \frac{e^{2t}}{2} - \int \frac{e^{2t}}{2} dt \right)$$

$$3 \left(t \times \frac{e^{2t}}{2} - \frac{1}{2} \times \int e^{2t} dt \right)$$

$$3 \left(t \times \frac{e^{2t}}{2} - \frac{1}{2} \times \frac{1}{2} e^{2t} \right)$$

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

3 $x^2 \sin x$

Solution

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

$$\begin{aligned} & x^2 x (-\cos(x)) - \int -(\cos(x)) \times 2x dx \\ & x^2 x (-\cos(x)) - 1x(-2) \times \int \cos(x) \times x dx \\ & x^2 x (-\cos(x)) + 2x \int x \cos(x) dx \\ & x^2 x (-\cos(x)) + 2(x \times \sin(x) - \int \sin(x) dx) \\ & x^2 x (-\cos(x)) + 2(x \times \sin(x) - (-\cos(x))) \\ & -x^2 x \cos(x) + 2x \times \sin(x) + 2\cos(x) \\ & -x^2 x \cos(x) + 2x \times \sin(x) + 2\cos(x) + C \\ & = -x^2 \cos(x) + 2x \sin(x) + 2\cos(x) + C \end{aligned}$$

4 $\cos 5x \cos 6x$

Solution

$$\begin{aligned} & \int \cos(5x) \cos(6x) dx \\ & \int \frac{1}{2} x (\cos(-x) + \cos(11x)) dx \\ & \int \frac{1}{2} x (\cos(x) + \cos(11x)) dx \\ & \frac{1}{2} x \int (\cos(x) + \cos(11x)) dx \\ & \frac{1}{2} x (\int \cos(x) dx + \int \cos(11x) dx) \\ & \frac{1}{2} x \left(\sin(x) + \frac{\sin(11x)}{11} \right) \\ & = \frac{\sin(x)}{2} + \frac{\sin(11x)}{22} + C \end{aligned}$$

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

Solution

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

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

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

$$\frac{1}{2} \left(\int \sin(9x) dx + \int \sin(5x) dx \right)$$

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

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