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$3te^t$

$\int 3te^{t}$

$u = 3t \qquad dv = e^{2t}$

$du = 3 \qquad v = \frac{1}{2}e^{2t}$

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

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

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

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

$u = x^2$ and $dv = \sin x\,dx$

$du = 2x\,, \quad v = -\cos x$

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

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

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

$u = 2x\,, \quad dv = \cos x\,dx$

$du = 2\,, \quad v = \sin x$

$\int 2x \cos x\,dx = 2x \sin x + 2\cos x + C$

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

8. $\int \sin 7x \cos 2x \, dx$; $A = 7x$, $B = 2x$

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

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

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

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

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