5) $\int \cos 5x \cos 6x \, dx$

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

$A = 5x, \quad B = 6x$

$= \frac{1}{2}(\cos 11x + (\cos -x)$

$= \frac{1}{2}(\cos 11x - \cos x$

$= \frac{1}{2}\int(\cos 11x - \cos x)dx$

$= \frac{1}{2}(\sin 11x - \sin x) + C$

$= \frac{1}{2}\left(\frac{\sin 11x}{11} - \frac{\sin x}{1}\right) + C$

$= \frac{\sin 11x}{22} - \frac{\sin x}{2} + C$

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

$u = x^2 \qquad dv = \sin x$

$\frac{du}{dx} = \frac{x^3}{3}$

$du = \frac{x^3}{3}dx \qquad v = -\cos x$

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

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

$= -\cos x(x^2) - (-\sin x \cdot \frac{x^4}{12} + C$

$\int x^2 \sin x\,dx = -\cos x(x^2) + \sin x\left(\frac{x^4}{12}\right) + C$

4) $\sin 7x \cos 2x = \frac{1}{2}(\sin(A+B) + \sin(A-B))$

$A = 7x \quad B = 2x$

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

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

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

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

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

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19/MHS07/128

MAT 10 f

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

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

$\frac{du}{dx} = \frac{1}{x}$

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

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

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

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

$= \frac{2x^3}{3} \ln x - \frac{2x^3}{9} + c$

$\int 2x^2 \ln x dx = \frac{2x^2}{3} \left[\ln x - \frac{1}{3}\right] + c$

2) $\int 3t e^{2t} dt$

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

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

$du = \frac{3t^2}{2} dt$

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

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

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

$\int 3t^{e^{2t}} dt = \frac{3}{2} te^{2t} - \frac{3 \cancel{t^2}}{4 \cancel{2}} e^{2t} + c$

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