Section 7.1 #1 Pg 476

$\int x e^{2x}\,dx \qquad u = x \qquad dv = e^{2x}\,dx$

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

$$\int f(x)g'(x)\,dx = f(x)g(x) - \int g(x)f'(x)\,dx$$

$f(x) = x \qquad g'(x) = e^{2x}$

$f'(x) = 1 \qquad g(x) = 1/2\, e^{2x}$

$$\int xe^{2x}\,dx = x\left(\frac{1}{2}e^{2x}\right) - \int \frac{1}{2}e^{2x}\,dx$$

$\frac{1}{2}\int dv$

$$\boxed{= \frac{1}{2}xe^{2x} - \frac{1}{4}e^{2x} + C}$$

[redacted]

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

$u = x \qquad dv = \cos 5x \, dx$

$du = dx \qquad v = \frac{1}{5} \sin 5x \rightarrow \frac{1}{5} v = \sin 5x$

$$\int f(x) g'(x) dx = f(x) g(x) - \int g(x) f'(x) dx$$

$f(x) = x \qquad g'(x) = \cos 5x$

$f'(x) = 1 \qquad g(x) = 1/5 \sin 5x$

$$= x\left(\frac{1}{5} \sin 5x\right) - \int \frac{1}{5} \sin 5x \, dx$$

$$= \frac{1}{5} x \sin 5x - \frac{1}{5} \int \sin 5x \, dx$$

$\rightarrow -\frac{1}{5} \cos 5x$

$$= \frac{1}{5} x \sin 5x + \frac{1}{25} \cos 5x + C$$

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$$\int t \csc^2 t \, dt$$

$u = t \qquad dv = \csc^2 t \, dt$

$du = dt \qquad v = -\cot t.$

$f(x) = t \qquad g'(x) = \csc^2 t$

$f'(x) = 1 \qquad g(x) = -\cot t$

$$\int f(x) g'(x) dx = f(x) g(x) - \int g(x) f'(x) dx$$

$$= -t \cot t - \int -\cot t \, dt$$

$z = \sin t$

$dz = \cos t \, dt$

$$\int \frac{\cos t}{\sin t} dt$$

$$\int \frac{1}{z} dz = \ln|\sin t|$$

$$= -t \cot t + \ln|\sin t| + C$$

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$$\int_0^2 y \sinh y \, dy$$

$u = y \qquad dv = \sinh y \, dy$

$du = dy \qquad v = \cosh y$

$$\int_0^2 y \sinh y \, dy = \Big[y \cosh y \Big]_0^2 - \int_0^2 \cosh y \, dy$$

$(0)(\cosh(0)) - 2\cosh(2)$

$\cancel{-}\, 2\cosh(2) - 0$

$\Big[\sinh y\Big]_0^2$

$\cancel{\sinh(0) - \sinh(2)}$

$\sinh(2) - \sinh(0)$

$$\boxed{+\,2\cosh 2 - \sinh(2)}$$

[redacted]

Section 7.1 #27 Pg 476

$$\int_1^5 \frac{\ln R}{R_2}\, dR$$

$u = \ln R$ $\qquad dv = \frac{1}{R^2}\, dR$

$du = \frac{1}{R}\, dR$ $\qquad v = -\frac{1}{R}$

$$= \left[\frac{-1}{R}\ln R\right]_1^5 - \int_1^5 -\frac{1}{R^2}\, dR$$

$$-\frac{1}{5}\ln 5 - -\frac{1}{1}\ln 1 \qquad \left.\frac{1}{R}\right]_1^5$$

$$-\frac{1}{5}\ln 5 \qquad \frac{1}{5} - \frac{1}{1} = -\frac{4}{5}$$

$$\boxed{-\frac{1}{5}\ln 5 + \frac{4}{5}}$$

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$$\int_0^\pi x \sin x \cos x \, dx$$

$$\frac{1}{2}\sin 2x = \sin x \cos x$$

$$\frac{1}{2}\int_0^\pi x \sin 2x \, dx$$

$u = x \qquad dv = \sin 2x \, dx$

$du = dx \qquad v = -\frac{1}{2}\cos 2x$

$$\frac{1}{2}\left[-\frac{1}{2}x\cos 2x\right]_0^\pi - \frac{1}{2}\int_0^\pi -\frac{1}{2}\cos 2x \, dx$$

$$-\frac{1}{4}\pi\cos 2\pi + \frac{+1}{4}\,0\cos 2(0)$$

$$\frac{1}{4}\left[\frac{1}{2}\sin 2x\right]_0^\pi$$

Both $\sin 0$ and $\sin 2\pi = 0$

$$-\frac{1}{4}\pi$$

$$\boxed{-\frac{\pi}{4}}$$