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Victor Guillermo Tovar Rafael

1- $\int x^2 \operatorname{sen} x \, dx$

$= x^2(-\cos(x)) - \int -\cos(x) 2x \, dx$

$= x^2(-\cos(x)) - 1(-2)\int \cos(x) \, x \, dx$

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

$= x^2(-\cos(x)) + 2(x \operatorname{sen}(x) - \int \operatorname{sen}(x) \, dx)$

$= x^2(-\cos(x)) + 2(x \operatorname{sen}(x) - (-\cos(x)))$

$= -x^2 \cos x + 2x \operatorname{sen} x + 2\cos x$

$= -x^2 \cos x + 2x \operatorname{sen} x + 2\cos x + c$

2- $\int x^3 e^{2x} \, dx$

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

$= x^3 \frac{e^{2x}}{2} - \frac{1}{2} 3 \int e^{2x} x^2 \, dx$

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

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

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

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

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

$= x^3 \frac{e^{2x}}{2} - \frac{3}{2}\left(x^2 \frac{e^{2x}}{2} - \left(x \frac{e^{2x}}{2} - \frac{1}{2}\left(\frac{1}{2}\right) e^{2x}\right)\right)$

$= \frac{x^3 e^{2x}}{2} - \frac{3x^2 e^{2x} - 3x e^{2x}}{4} - \frac{3e^{2x}}{8}$

$= \frac{x^3 e^{2x}}{2} - \frac{3x^2 e^{2x} - 3x e^{2x}}{4} - \frac{3e^{2x}}{8} + c$

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$3.- \int x^2 \sqrt{(1-x)}\, dx$

$= \int -t^2 \sqrt{t} + 2t\sqrt{t} - \sqrt{t}\, dt$

$= \int -t^2 (t^{\frac{1}{2}}) + 2t (t^{\frac{1}{2}}) - t^{\frac{1}{2}}\, dt$

$= \int - t^2 (t^{\frac{1}{2}}) + 2t (t^{\frac{1}{2}}) - t^{\frac{1}{2}}\, dt$

$= \int - t^{\frac{5}{2}} + 2t^{\frac{3}{2}} - t^{\frac{1}{2}}\, dt$

$= -\int t^{\frac{5}{2}}\, dt + \int 2t^{\frac{3}{2}}\, dt - \int t^{\frac{1}{2}}\, dt$

$= -\frac{2t^3\sqrt{t}}{7} + \frac{4t^2\sqrt{t}}{5} - \frac{2t\sqrt{t}}{3}$

$= -\frac{2(1-x)^3(\sqrt{1-x})}{7} + \frac{4(1-x)^2(\sqrt{1-x}}{5} - \frac{2(1-x)(\sqrt{1-x})}{3}$

$= \frac{2\sqrt{1-x}\,(1-3x+3x^2-x^3)}{7} + \frac{4\sqrt{1-x}\,(1-2x+x^2)}{5} - \frac{2(1-x)(\sqrt{1-x})}{3}$

$= \frac{2\sqrt{1-x}\,(1-3x+3x^2-x^3)}{7} + \frac{4\sqrt{1-x}\,(1-2x+x^2)}{5} - 2\frac{(1-x)(\sqrt{1-x})}{3}$

$+ C$

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4.- $\int e^{ax} \cos bx\, dx$

$= \cos bx \left(\frac{1}{a} e^{ax}\right) - \int \frac{1}{a} e^{ax} (-b \operatorname{sen} bx)\, dx$

$= \frac{1}{a} e^{ax} \cos bx + \frac{b}{a} \int e^{ax} \operatorname{sen} bx\, dx$

$= \frac{1}{a} e^{ax} \cos bx + \frac{b}{a} \left(\frac{1}{a} e^{ax} \operatorname{sen} bx - \int \frac{1}{a} e^{ax} (b \cos bx)\, dx \right)$

$= \frac{1}{a} e^{ax} \cos bx + \frac{b}{a} \left(\frac{1}{a} e^{ax} \operatorname{sen} bx - \frac{b}{a} \int e^{ax} \cos bx\, dx \right)$

$= \frac{1}{a} e^{ax} \cos bx + \frac{b}{a^2} e^{ax} \operatorname{sen} bx - \frac{b^2}{a^2} \int e^{ax} \cos bx\, dx$

$= \int e^{ax} \cos bx\, dx + \frac{b^2}{a^2} \int e^{ax} \cos bx\, dx = \frac{1}{a} e^{ax} \cos bx + \frac{b}{a^2} e^{ax} \operatorname{sen} bx$

$= \frac{a^2 + b^2}{a^2} \int e^{ax} \cos bx\, dx = \frac{1}{a} e^{ax} \cos bx + \frac{b}{a^2} e^{ax} \operatorname{sen} bx$

$= \int e^{ax} \cos bx\, dx = \frac{a^2}{a^2+b^2} \left(\frac{1}{a} e^{ax} \cos bx + \frac{b}{a^2} e^{ax} \operatorname{sen} bx \right)$

$= \int e^{ax} \cos bx\, dx = \frac{a}{a^2+b^2} e^{ax} \cos bx + \frac{b}{a^2+b^2} e^{ax} \operatorname{sen} bx$

$= \int e^{ax} \cos bx\, dx = \frac{a}{a^2+b^2} e^{ax} \cos bx + \frac{b}{a^2+b^2} e^{ax} \operatorname{sen} bx + C$

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5.- $\int \text{Sen}^3 x \, dx$

$= \int \text{sen}^2 x \, \text{sen}\, x \, dx$

$= \int (1-\cos^2 x)\, \text{sen}(x)\, dx$

$= \int (\text{sen}(x) - \cos^2 x \, \text{sen}(x))\, dx$

$= \int \text{sen}(x)\, dx - \int \cos^2 x \, \text{sen}(x)\, dx$

$= -\cos(x) + \int \cos^2 x \, (-\text{sen}(x))\, dx$

$= -\cos(x) + \frac{\cos^3 x}{3}$

$= -\cos(x) + \frac{\cos^3 x}{3} + C$

6.- $\int \text{Sen}\, 3x \cos 2x \, dx$

$= \int \frac{1}{2} (\text{sen}\, 5x + \text{sen}\, x)\, dx$

$= \frac{1}{2} \int \text{Sen}\, 5x + \text{sen}\, x \, dx$

$= \frac{1}{2} \int \text{sen}\, 5x \, dx + \int \text{sen}\, x \, dx$

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

$= \frac{\cos 5x}{10} - \frac{\cos x}{2}$

$= -\frac{\cos 5x}{10} - \frac{\cos x}{2} + C$

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$$7{:}\ \int \mathrm{Sen}(\ln x)\,dx$$

$$= \mathrm{Sen}(t)\,e^t - \int e^t \cos(t)\,dt$$

$$= \mathrm{Sen}(t)\,e^t - \int \cos(t)\,e^t\,dt$$

$$= \mathrm{Sen}(\pm)\,e^t - (\cos(t)\,e^t - \int e^t(-\mathrm{sen}(t)\,dt)$$

$$= \mathrm{Sen}(t)\,e^t - (\cos(t)\,e^t + \int e^t\,\mathrm{sen}(t)\,dt)$$

$$= \int e^t\,\mathrm{sen}(t)\,dt = \mathrm{Sen}(t)\,e^t - (\cos(t)\,e^t + \int e^t\,\mathrm{sen}(t)\,dt))$$

$$= \int e^t\,\mathrm{sen}(t)\,dt = \mathrm{sen}(t)\,e^t - \cos t\,e^t - \int e^t\,\mathrm{sen}(t)\,dt$$

$$= \int e^t\,\mathrm{sen}(t)\,dt + \int e^t\,\mathrm{sen}(t)\,dt = \mathrm{sen}(t)\,e^t - \cos(t)\,e^t$$

$$= 2\int e^t\,\mathrm{Sen}(t)\,dt = \mathrm{sen}(t)\,e^t - \cos(t)\,e^t$$

$$= \int e^t\,\mathrm{sen}(t)\,dt = \frac{\mathrm{sen}(t)\,e^t}{2} - \frac{\cos(t)\,e^t}{2}$$

$$= \frac{\mathrm{sen}(\ln(x))\,e^{\ln(x)}}{2} - \frac{\cos(\ln(x))\,e^{\ln(x)}}{2}$$

$$= \frac{\mathrm{sen}(\ln(x))\,x}{2} - \frac{\cos(\ln(x))\,x}{2}$$

$$= \frac{\mathrm{sen}(\ln(x))\,x - \cos(\ln(x))\,x}{2}$$

$$= \frac{\mathrm{Sen}(\ln(x))\,x - \cos(\ln(x))\,x}{2} + C$$

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$8{:}\ \int x^2 \ln x\, dx$ y $9{:}$

$= \int \ln(x)\, x^2\, dx$

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

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

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

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

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

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

$10{:}\ \int \ln(x^2)\cos(x)\, dx$

$= \ln(x^2)\,\mathrm{sen}(x) - \int \mathrm{sen}(x)\, 2\frac{1}{x}\, dx$

$= \ln(x^2)\,\mathrm{sen}(x) - 2\int \mathrm{sen}(x)\frac{1}{x}\, dx$

$= \ln(x^2)\,\mathrm{sen}(x) - 2\int \frac{\mathrm{sen}(x)}{x}\, dx$

$= \ln(x^2)\,\mathrm{sen}(x)$

$= \ln(x^2)\,\mathrm{sen}(x) + C$