Maestro: Juan José Ojeda

Alumno: Jesús Eduardo Gómez Figueroa

Materia: Matemática aplicada

Trabajo: Problemario

10 de julio del año 2020

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

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

$u = x^2$ $\quad dv = \operatorname{sen} x\,dx$

$du = 2x.dx$ $\quad \int dv = \int dv = \int \operatorname{sen} x\,dx$

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

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

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

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

$\int 2x . \cos dx$

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

$du = 2dx$ $\quad v = \operatorname{sen} x$

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

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

$= 2x . \operatorname{sen} x - 2\int \operatorname{sen} x\,dx$

$= 2x . \operatorname{sen} x + 2\cos x + C$

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

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

2. $\int x^2 e^{2x}\, dx$

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

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

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

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

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

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

3.- $\int x2 \sqrt{(1-x)}\, dx$

$$= \int (1-v^2)^2 v(-2v)\, dv = 2\int (1-2v^2+v^4)(-v^2)\, dv$$

$$= \int (-v^2+2v^4-v^6)\, dv$$

$$= -2\int v^2 dv + 4\int v^4 dv - 2\int v^6 dv$$

$$= -2\frac{v^3}{3} + 4\frac{v^5}{5} - 2\frac{v^7}{7} + C$$

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

6. $\int \operatorname{sen} 3x \cos 2x \, dx$

$= \int \frac{1}{2} [\operatorname{sen}(3-2)x + \operatorname{sen}(3+2)x] \, dx$

$= \frac{1}{2} \int [\operatorname{sen} x + \operatorname{sen} 5x] \, dx = \frac{1}{2} \int \operatorname{sen} x \, dx + \frac{1}{2} \int \operatorname{sen} 5x \, dx$

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

$= -\frac{1}{2} \cos x - \frac{1}{10} \cos 5x + C$

7. $\int \operatorname{sen}(\ln x)\,dx = x\operatorname{sen}(\ln x) - x\cos(\ln x) - \int \operatorname{sen}(\ln x)\,dx$

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

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

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

$$\int \operatorname{sen}(\ln x)\,dx = \frac{1}{2}x\operatorname{sen}(\ln x) - \frac{1}{2}x\cos(\ln x) + C$$

8. $x^2 \ln x \, dx$

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

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

$$= \frac{x^3}{3} \ln x - \frac{1}{3} \frac{x^3}{3} + C$$

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

9. $\int \cos(\ln x)\,dx = x\cos(\ln x) + x\,\text{sen}(\ln x) - \int \cos(\ln x)\,dx$

$\int \cos(\ln x)\,dx + \int \cos(\ln x)\,dx = x\cos(\ln x) + x\,\text{sen}(\ln x)$

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

$\int \cos(\ln x)\,dx = \frac{x\cos(\ln x) + x\,\text{sen}(\ln x)}{2} + C$

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