Ejemplos de integración por partes

1.- $\int xsenxdx$

u = x dv = sen x dx

du = dx $\int dv = \int senxdx$ $\int sen\,u\,du = -\cos u + c$

$$v = -cosx + c$$

$$\int udv = u * v - \int vdu$$

$$\int x\,senx\,dx = x(-cos\,x) - \int (-cos\,x)dx$$

$$\int x\,senx\,dx = -xcosx + senx + C$$

2.- $\int lnxdx$

u = ln x dv = dx $\frac{d(Ln(u))}{dx} = \frac{1}{u}\frac{d(u)}{dx}$

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

$$v = x + c$$

$$\int udv = u * v - \int vdu$$

$$\int lnx\,dx = lnx(x) - \int x\frac{1}{x}dx = xlnx - x$$

3.- $\int t^2 e^t dt$

u = t^2 $dv = e^t dt$ $\frac{d(u^n)}{dx} = nu^{n-1}\frac{d(u)}{dx}$

du = 2tdt $\int dv = \int e^t dt$ $\int e^u du = e^u + c$

$v = e^t + c$

$$\int udv = u * v - \int vdu$$

$$\int t^2 e^t dt = t^2 e^t$$

4.- $\int xcosxdx$

u = x dv = cos x dx

du = dx $\int dv = \int cosxdx$ $\int cos\, u\, du = \text{sen}\, u + c$

$v = senx + c$

$$\int udv = u * v - \int vdu$$

$\int xcosxdx = x * senx - \int senxdx$ $\int sen\, u\, du = -\cos u + c$

$= x\, senx - (-\cos x) = x\, senx + \cos x$

$$\int xcosxdx = xsen\, x + cos\, x + C$$

5.- $\int x^2 senxdx$

u = x^2 dv = sen x dx $\frac{d(u^n)}{dx} = nu^{n-1}\frac{d(u)}{dx}$

du = 2xdx $\int dv = \int senxdx$ $\int sen\,u\,du = -\cos u + c$

$$v = -cosx + c$$

$$\int udv = u * v - \int vdu$$

$$\int x^2 \text{senxdx} = x^2(-cosx) - \int(-cosx)2xdx$$

$$= -x^2 cosx + 2\int cosx * xdx$$

$\int xcosxdx$ **se resuelve otra vez por partes**

Del ejemplo anterior: $\int xcosxdx = xsenx + cosx + c$

$$\int x^2 \text{senxdx} = -x^2 cosx + 2\,(\text{xsenx} + \text{cosx}) = -x^2 cosx + 2xsenx + 2cosx$$

$$\int x^2 \text{senxdx} = 2xsenx + (2 - x^2)cosx + C$$

6.- $\int e^x senx dx$

u = e^x dv = sen x dx $\frac{d(e^u)}{dx} = e^u \frac{d(u)}{dx}$

du = $e^x dx$ $\int dv = \int senx dx$ $\int sen\, u\, du = -\cos u + c$

$$v = -cosx + c$$

$$\int udv = u * v - \int vdu$$

$$\int e^x senx dx = e^x(-cosx) - \int (-cosx)e^x dx$$

$\int e^x senx dx = -e^x cosx + \int cosx\, e^x dx$ **Integrando por partes, otra vez**

u = e^x dv = cosx dx $\frac{d(e^u)}{dx} = e^u \frac{d(u)}{dx}$

du = $e^x dx$ $\int dv = \int cosx dx$ $\int cos\, u\, du = \text{sen}\, u + c$

$$v = senx$$

$\int e^x senx dx = -e^x cosx + e^x senx - \int senx\, e^x dx$ **Aquí está el TIP**

$$\int \mathbf{e^x senx dx} + \int \mathbf{e^x senx dx} = -e^x cosx + e^x senx$$

$$\mathbf{2} \int e^x senx dx = -e^x cosx + e^x senx$$

$$\int e^x\, senx\, dx = \frac{e^x(senx - cosx)}{2} + C$$