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

$$\int x \sin x\,dx$$

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

$du = dx \qquad v = -\cos x$

$$\int x \sin x\,dx = -x\cos x + \int \cos x\,dx = -x\cos x + \sin x + C$$

$$\int y \ln y\,dy$$

$$\int x \sec^2 x\,dx$$

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

$$\int x^3 \ln x \, dx$$

$$\int e^y \sin y \, dy$$

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

حل المعـــــادلة التفاضليــــــة :

$$\frac{dy}{dx} = x^2 \ln x$$

$$\int \ln x \, dx$$

إذا كان ميل مماس المنحني $y = f(x)$ عند النقطة (x, y) هو $x^3 \ln x$

أوجـــــــــــد :

معادلة المنحني $y = f(x)$ إذا علمت أنه يمر بالنقطة $(1, 0)$

$$\int \ln x \, dx = \int (\ln x \times 1)\, dx$$

$u = \ln x$ and $\dfrac{dv}{dx} = 1$

$\dfrac{du}{dx} = \dfrac{1}{x}$ and $v = x$

$$= x \ln x - \int \left(x \times \frac{1}{x}\right) dx + c$$

$$= x \ln x - \int 1 \, dx + c$$

$$= x \ln x - x + c$$

$$\int \ln x \, dx = x \ln x - x + c$$

Find $\int x \sec x \tan x \, dx$

Let $u = x$ $\quad \dfrac{dv}{dx} = \sec x \tan x$

$\dfrac{du}{dx} = 1$ $\quad v = \sec x$

Remember

$$\int \sec x \tan x \, dx = \sec x$$

This is one of our standard integrals

$$\int x \sec x \tan x \, dx = x \sec x - \int \sec x \, dx + c$$

$$= x \sec x - \ln |\sec x + \tan x| + c$$

Find $\int x \sec^2 x \, dx$

Let $u = x$ $\quad \dfrac{dv}{dx} = \sec^2 x$

$\dfrac{du}{dx} = 1$ $\quad v = \tan x$

$$\int x \sec^2 x \, dx = x \tan x - \int \tan x \, dx + c$$

$$= x \tan x - \ln |\sec x| + c$$

Find $\int e^x \cos x \, dx$

$$\int e^x \cos x \, dx = e^x \sin x - \int e^x \sin x \, dx + c$$

Try $u = e^x$ $\quad \frac{dv}{dx} = \cos x$

$\frac{du}{dx} = e^x$ $\quad v = \sin x$

$$\int e^x \cos x \, dx = e^x \sin x - \left(- e^x \cos x - \int - e^x \cos x \, dx \right) + c$$

$$\int e^x \cos x \, dx = e^x \sin x + e^x \cos x - \int e^x \cos x \, dx + c$$

Let $u = e^x$ $\quad \frac{dv}{dx} = \sin x$

$\frac{du}{dx} = e^x$ $\quad v = - \cos x$

$$\int e^x \cos x \, dx = e^x \sin x + e^x \cos x - \int e^x \cos x \, dx + c$$

Let $\int e^x \cos x \, dx = I$

Then $I = e^x \sin x + e^x \cos x - I + c$

$$2I = e^x \sin x + e^x \cos x + c$$

Thus $I = \frac{1}{2}\left(e^x \sin x + e^x \cos x \right) + c$

$$= \frac{e^x}{2}\left(\sin x + \cos x \right) + c$$