Evaluate $I = \int x \cos(x)\, dx$

u= x du =dx

dv = cos (x) dx $v = \int \cos(x) dx = \sin x$

then$\int x\, cos\, (x) dx = \int u\ dv = u.v - \int v\, du$

$$= x\, sin(x) - \int sin\, (x) dx$$

$$= x\, sin\, (x) + cos\, (x) + c$$

<u>Tabular Integration</u>

Consider the integral of the form $\int f(x) g(x) dx$ in which $\int f(x)$ can be differential repeatedly to Zero and $g(x)$ can be integral repeatedly without difficulty Tabular integration save a great deal of work as natural method consider from integration

$f(x)$ **and Its derivative**		$g(x)$ **and Its Integrals**
$f(x)$		$g(x)$
$f'(x)$	+	$\int g(x)dx = g_1(x)$
$f''(x)$	-	$\int g_1(x)dx = g_2(x)$
$f'''(x)$	+	$\int g_2(x)dx = g_3(x)$
$\vdots$		$\vdots$
$f^{n-1}(x)$		
$f^{n}(x) = 0$		$g_{n-1}(x)dx = g_n(x)$

$$I = f(x)g_1(x) - f'(x)g_2(x) + f''(x)g_3(x) - \ldots\ldots\ldots \pm f^{n-1}(x)g_n(x)$$

Evaluate $I = \int x^2 e^x dx$

Solution :-

$f(x)$ **and Its derivative**		$g(x)$ **and Its Integrals**
x^2		e^x
$2x$	+	$\int e^x dx = e^x$
2	-	$\int e^x dx = e^x$
0	+	$\int e^x dx = e^x$

$$I = \int x^2 e^x dx = x^2 e^x - 2xe^x + 2e^x + c$$

Evaluate $I = \int \left(x^3 - 2x^2 + 3x + 1\right)\sin(2x)\,dx$

Solution :-

$f(x)$ **and Its derivative**	sign	$g(x)$ **and Its Integrals**
$x^3 - 2x^2 + 3x + 1$		$\sin(2x)$
$3x^2 - 4x + 3$	+	$\int \sin(2x)dx = -\frac{1}{2}\cos(2x)$
$6x - 4$	-	$\int -\frac{1}{2}\cos(2x)dx = -\frac{1}{4}\sin(2x)$
6	+	$\int -\frac{1}{4}\sin(2x)dx = \frac{1}{8}\cos(2x)$
0	-	$\int \frac{1}{8}\cos(2x) = \frac{1}{16}\sin(2x)$

$I = \ldots$

Evaluate $I = \int e^x \sin(x)\,dx$

Solution :- $u = e^x \qquad dv = \sin(x)dx$

$du = e^x dx \qquad v = -\cos(x)$

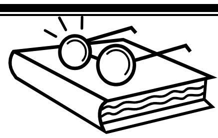
$$I = -e^x\cos(x) + \int e^x \cos(x)dx = -e^x\cos(x) + j$$

Where $j = \int e^x \cos(x)dx \Rightarrow \quad u = e^x \qquad dv = \cos(x)dx$

$du = e^x dx \qquad v = \sin(x)$

$$j = e^x\sin(x) - \int e^x \sin(x)dx = e^x\sin(x) - I$$

$$I = -e^{x}\cos(x) + e^{x}\sin(x) - I \quad \Rightarrow \quad 2I = -e^{x}\cos(x) + e^{x}\sin(x) \Rightarrow = \frac{1}{2}e^{x}\left(\cos(x) - \sin(x)\right)$$



How To Solve

1	$\int x^{2}\ln(x+1)dx$	$\int x.\sec^{-1}(x)dx$	$\int x^{2}\tan^{-1}(x)\,dx$	$\int \sin(\sqrt{2x})dx$
2	$\int \left(x^{-2} + x^{-1} + 1\right)\ln(x)dx$	$\int \left(x^{3} + x^{2} + x + 1\right)e^{-2x}dx$	$\int e^{-x}\sin(x)dx$	$\int x\sqrt{1-x}$
3	$\int x^{3}e^{-x}dx$	$\int \sin[\ln(x)]dx$		

Good Luck ..