Integration By Parts (Day 2)

tabular method — use when u = algebraic part

1. make a list of derivatives & integrals
2. alternate signs (+, −, +, −, etc.)
3. link parts diagonally (multiply)
4. combine together to get an expression

EX1 $\int xe^x dx$

LIATE

$u = x \quad dv = e^x dx$

$du = 1\,dx \quad v = \int e^x dx = e^x$

$xe^x - \int e^x dx$

$\boxed{xe^x - e^x + C}$

tab. method

	u	dv
+	x	e^x
−	1	e^x
+	0	e^x

$\boxed{xe^x - e^x + C}$

EX2 $\int x^3 \sin x\, dx$

	u	dv
+	x^3	$\sin x$
−	$3x^2$	$-\cos x$
+	$6x$	$-\sin x$
−	6	$\cos x$
+	0	$\sin x$

$\boxed{-x^3\cos x + 3x^2\sin x + 6x\cos x - 6\sin x + C}$

EX3 $\int x^2 e^{2x}\,dx$

	u	dv
+	x^2	e^{2x}
		$\frac{1}{2}e^{2x}$
−	$2x$	
		$\frac{1}{4}e^{2x}$
+	2	
		$\frac{1}{8}e^{2x}$
−	0	

$\int e^{2x}\,dx \qquad \frac{1}{2}\int e^u\,du = \frac{1}{2}e^u$

$u = 2x$

$\frac{du}{dx} = 2 \qquad \frac{1}{2}du = dx$

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