

## 6.2 Integration by parts (分部積分)

$$d(uv) = u dv + v du$$

$$u dv = d(uv) - v du$$

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

Ex1:  $\int \ln x dx$

$u$	$dv$
$\ln x$	$1 dx$
$\frac{1}{x}$	$x$

$$x \ln x - \int x \cdot \frac{1}{x} dx = x \ln x - x + c$$

Ex2:  $\int x e^x dx = \int x d e^x$

$$= x e^x - e^x + c$$

$u$	$dv$
$x$	$e^x$
$1$	$e^x$
$0$	$e^x$

$$x e^x - e^x + c$$

$u$ 先	$\ln x$ (對數)	$\sin^{-1} x$ (反三角)	$x^n$ (多項式)	$e^x$ (指數)	$\sin x$ (三角)
----------	-----------------	------------------------	----------------	---------------	------------------

Ex3:  $\int x^2 \sin x dx$

$u$	$dv$
$x^2$	$\sin x$

$2x$	$-\cos x$
------	-----------

$2$	$-\sin x$
-----	-----------

$0$	$\cos x$
-----	----------

---


$$-x^2 \cos x + 2x \sin x + 2 \cos x + c$$

$$\text{Ex4: } \int_1^e x \ln x dx$$

$$\text{Ex5: } \int \frac{xe^x}{(x+1)^2} dx$$

$$\text{Ex6: } \int \cos^n x dx$$

The logo of Southern Taiwan University is a stylized, interlocking design. It consists of two main shapes: a blue shape on the left and a red shape on the right, both with white curved cutouts. The shapes are intertwined, creating a sense of unity and balance.

南台科技大學  
Southern Taiwan University