

6.2 Integration by parts (分部積分)

$$d(uv) = udv + vdu$$

$$udv = d(uv) - vdu$$

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

Ex1: $\int \ln x dx$

$$\begin{array}{ccc} u & & dv \\ \ln x & \searrow & 1 dx \\ \frac{1}{x} & \longleftarrow & x \end{array}$$

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

Ex2: $\int xe^x dx = \int x de^x$

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

$$\begin{array}{ccc} u & & dv \\ x & \searrow & e^x \\ 1 & \longleftarrow & e^x \\ 0 & & e^x \end{array}$$

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

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

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

$$2 \quad -\sin x$$

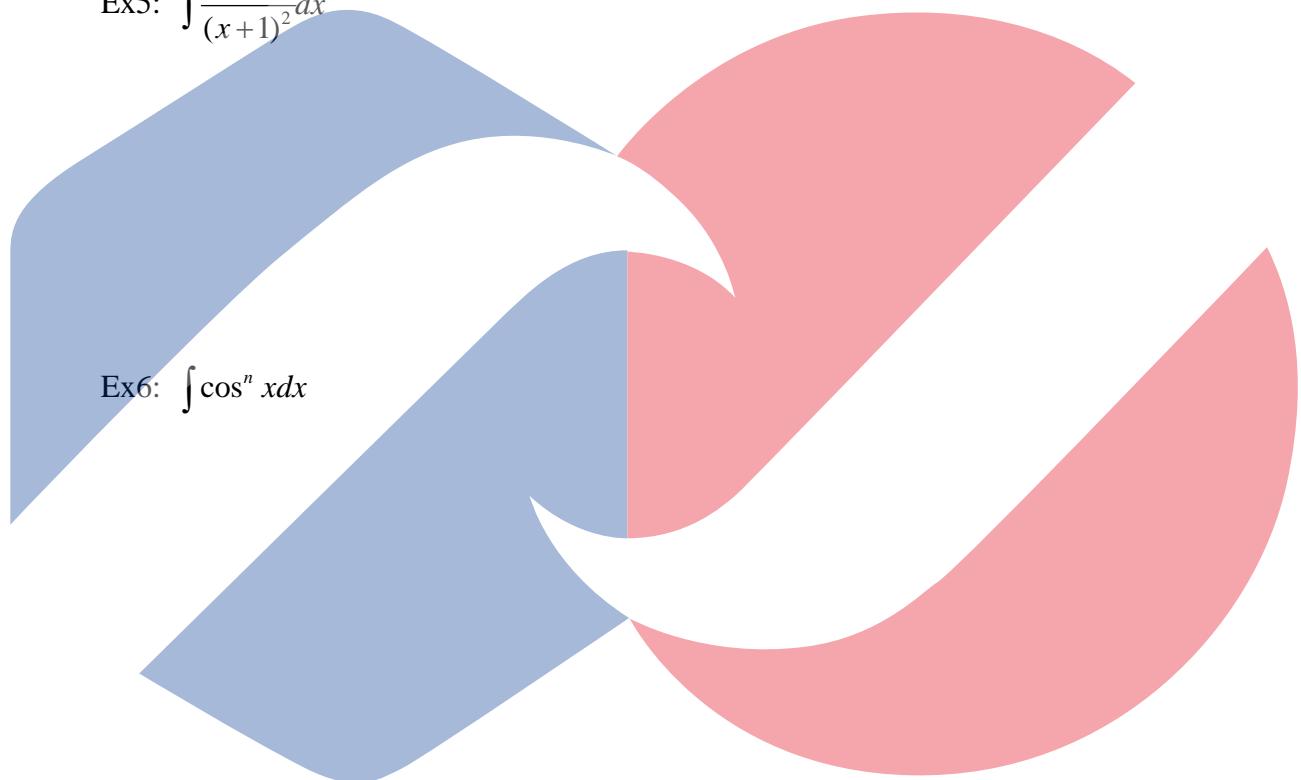
$$0 \quad \cos x$$

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

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

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

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



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