

Derivatives

that show up regularly in Integration by Parts

u	du
x	1
nx	n
x ⁿ	nx ⁿ⁻¹
sin x	cos x
cos x	-sin x
-sin x	-cos x
-cos x	sin x
ln x	1/x
ln x	1/x
ln -x	1/x
sec x	sec x tan x

u	du
n ^x	(ln n) n ^x
log _n x	1 / (x ln n)
e ^x	e ^x
arcsin x aka sin ⁻¹ x	1 / √(1-x ²)
arccos x aka cos ⁻¹ x	-1 / √(1-x ²)
arctan x aka tan ⁻¹ x	1 / (x ² + 1)

aka means **Also Known As**

Note: this is *not* a complete list of derivatives & integrals, but it will get you started.

INTEGRATION

BY PARTS

Facts to have on hand

dv	v	dv	v
n	nx	sin x	-cos x
x ⁿ	x ⁿ⁺¹ / (n+1)	cos x	sin x
1/x	ln x	-cos x	-sin x
e ^x	e ^x	-sin x	cos x
n ^x	n ^x / ln(n)	cot x	ln sin x
ln x	x ln x - x	sec ² x	tan x
sec x	ln sec x + tan x	csc ² x	-cot x
sec x tan x	sec x		
csc x	ln csc x + cot x		

Compiled by
Paula Beardell Krieg
@PaulaKrieg

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

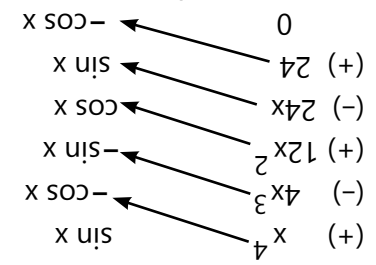
Facts to have handy when evaluating

dv	v
1	x
x	x ² / 2
2x	x ²
x ²	x ³ / 3

dv	v
e ^{2x}	e ^{2x} / 2
e ^{-3x}	-e ^{-3x} / 3
sin 4x	-cos 4x / 4
cos 4x	sin 4x / 4
sin 4x	-cos 4x / 4
cos 4x	sin 4x / 4
sin 4x	-cos 4x / 4
cos 4x	sin 4x / 4

Tabular Integration: $\int x^n \sin x dx = ?$

signs $n = 4$
 $dv = \sin x dx$



$$= -x^4 \cos x + 4x^3 \sin x + 12x^2 \cos x - 24x \sin x - 24 \cos x + C$$

● Rearrange: $\int u dv = uv - \int v du$ Ta-dai! IBP formula (hey, remember to finish evaluations by attaching + C to indefinite integrals)

● Rewritten: $uv = \int u dv + \int v du$

$$f(x) = u \quad f'(x) dx = du$$

$$g(x) = v \quad g'(x) dx = dv$$

● Rewrite in IBP friendly notation such that:

$$\int f(x)g(x) dx = \int f(x)g'(x) dx + \int g(x)f'(x) dx$$

Four Steps from Product Rule to IBP formula

Product Rule: $\frac{d}{dx} [f(x)g(x)] = f'(x)g(x) + g'(x)f'(x)$

Chain Rule: $\frac{d}{dx} f(g(x)) = f'(g(x)) \cdot g'(x)$

u	du
0	0
x	x ² / 2
1	x
x ²	x ³ / 3
2x	x ²
2x	x ³ / 3

u	du
e ^x	e ^x
e ^{-x}	-e ^{-x}
3e ^{3x}	e ^{3x}
2e ^x	e ^x
e ⁻¹	e ⁻¹
e ^x	e ^x