

## §7.1 INTEGRATIONS BY PARTS

DERIVATIVES - Product Rule

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

$$f(x)g'(x) = \frac{d}{dx} [f(x)g(x)] - g(x)f'(x)$$

INTEGRALS - INTEGRATION BY PARTS

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

$$\text{Let } u = f(x) \\ du = f'(x) dx$$

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

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

ONE INTEGRAL  
REPLACED BY  
ANOTHER.

HOPEFULLY  
EASIER TO  
EVALUATE!

ex  $\int x \ln x dx$

ex  $\int \ln x dx$

ex  $\int x^2 e^x dx$

WHICH FACTOR IS  $u$ ? AND WHICH IS  $dv$ ?

•) IN GENERAL, SET  $u =$  FACTOR WITH A DERIVATIVE THAT IS SIMPLER,  
PREFERABLE TO WORK WITH

$dv =$  FACTOR WITH A KNOWN ANTI-DERIVATIVE.

•) RULE OF THUMB: IN ORDER, TRY SETTING  $u =$

L.I.A.T.E.

LOGARITHMIC FUNCTION

INVERSE FUNCTION

ALGEBRAIC EXPRESSIONS (POWERS, ROOTS)

TRIG. FUNCTIONS

EXPONENTIAL FUNCTIONS

ex  $\int e^x \sin x dx$

ex.  $\int_0^2 x \sinh x dx$

ex  $\int_1^5 \frac{\ln x}{x^2} dx$