

## Integration By Parts Highlights

### Integration By Parts

If  $u$  and  $v$  are continuous functions of  $x$  and have continuous derivatives, then

$$\boxed{\int u \, dv = u \, v - \int v \, du}$$

How do you choose  $u$ ? “Let’s Integrate **All Things Easily**”

Choose  $u$  from the list below in this order.

<u>Function</u>	<u>Example</u>
Logarithmic	$\ln x$
Inverse Trigonometric	$\arctan x$
Algebraic	$x$
Trigonometric	$\sin x$
Exponential	$e^x$

Example:

$$\int x \ln x \, dx$$

$$u = \ln x \qquad dv = x \, dx$$

$$du = \frac{1}{x} dx \qquad v = \frac{1}{2} x^2$$

$$u \, v - \int v \, du : \qquad \frac{1}{2} x^2 \ln x - \int \left( \frac{1}{2} x^2 \right) \left( \frac{1}{x} \right) dx$$

$$\frac{1}{2} x^2 \ln x - \frac{1}{2} \int x \, dx$$

$$\frac{1}{2} x^2 \ln x - \left( \frac{1}{2} \right) \left( \frac{1}{2} \right) x^2 + C$$

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