Formula: | |

Guidelines for choosing u and dv:

LIATE

Integral	$u =$	$dv =$
$\int x^3 \ln x \, dx$	$\ln x$	$x^3 \, dx$
$\int \sin x \ln \lvert \cos x \rvert \, dx$		
$\int x^2 \cos x \, dx$		
$\int 3x \, e^{-x} \, dx$		
$\int e^x \tan x \, dx$		

If LIATE does not work:

- Let dv be the most complicated portion of the integrand AND the one you know how to integrate
- Let u be that portion of the integrand whose derivative du is a simpler function than u itself

$$\int x^4 \sqrt{2 - x^3} \, dx$$

If we choose $u = x^4$ and $dv = \sqrt{2 - x^3} \, dx$ we wouldn't know how to integrate dv.

However, from the section on integration by substitution, we would know how integrate the following

$$\int x^{\boxed{}} \sqrt{2 - x^3} \, dx$$

This means that for our integration by parts we need,

$u =$ $\boxed{}$, $dv =$ $\boxed{}$

Using integration by parts several times:

Important

DO NOT switch choices for u and dv in successive applications

Example: $\displaystyle\int x^2 \cos x \, dx$

$$u = x^2, \qquad du = 2x\,dx$$

$$dv = \cos x\,dx, \qquad v = \sin x$$

Applying the integration by parts formula:

$$\int x^2 \cos x\,dx = \boxed{} - \int \boxed{}\,dx$$

To solve the last integral we need to apply integration by parts one more time,

Right choice:	Wrong choice:
$u = \boxed{}$	$u = \boxed{}$
$dv = \boxed{}$	$dv = \boxed{}$

Example: $\int x^5\, e^{3x}\, dx$

Differentiate u		Integrate dv
$\downarrow$	$\searrow$	$\downarrow$
Differentiate up to 0	Alternate + and −	Integrate as many times as you differentiate
$\downarrow$	$\searrow$	$\downarrow$

Example: $\int e^x \sin(2x)\,dx$

$u = \square \qquad du = \square$

$dv = \square \qquad v = \square$

One integration by parts:

$$\int e^x \sin(2x)\,dx = \square - \int \square \, dx$$

To solve the last integral we should have

$u = \square \qquad du = \square$

$dv = \square \qquad v = \square$

so that the second integration by parts gives:

$$\int e^x \sin(2x)\,dx = \square - \square + \int \square$$

$$\int e^x \sin(2x)\,dx = \square - \square + \int \square \, e^x \sin(2x)\,dx$$