

Cypress College Math Review: Integration by Parts

Integration by Parts is a method that allows us to integrate more types of integrals, especially those consisting of a product of two functions. Let $u = u(x)$ and $v = v(x)$ be differentiable functions of x .

Guideline for choosing u and dv : Try letting dv be the most complicated part of the integrand that fits a basic integration rule. When choosing which factor to use as your “ u ” to differentiate, you can use the acronym L.I.A.T.E. Choose the factor that is: logarithmic, inverse trig, algebraic, trig, exponential – in that order.

Tabular method for integration by parts:

Example: $\int x^2 \ln x \, dx$

Example: $\int e^{4x} \cos 3x \, dx$

Example: $\int x^3 \sin x \, dx$

Extra Practice – Try these on your own, then check with the answers below.

1. $\int 4x \ln x \, dx$

2. $\int e^{2x} \sin 3x \, dx$

3. $\int x^2 \cos x \, dx$

4. $\int x^4 \sin 2x \, dx$

Answers

1. $2x^2 \ln x - x^2 + C$

2. $\frac{2}{13} e^{2x} \sin 3x - \frac{3}{13} e^{2x} \cos 3x + C$

3. $x^2 \sin x + 2x \cos x - 2 \sin x + C$

4. $-\frac{x^4}{2} \cos 2x + x^3 \sin 2x + \frac{3}{2} x^2 \cos 2x - \frac{3}{2} x \sin 2x - \frac{3}{4} \cos 2x + C$