

1 8.1: Integration by Parts

Recall the Product Rule for Derivatives (use u , v du , and dv):

$$d(uv) =$$

Integrate both sides and solve for u dv :

$$\text{Therefore } \int u \, dv =$$

This formula is the key to **Integration by Parts**. The key is to choose what part of the integral is to be u and what part is to be dv .

Examples:

$$\int x \cos x \, dx =$$

$$\int_0^1 x^2 e^{-2x} dx =$$

$$\int x^2 \ln x dx =$$

$$\int \tan^{-1} x \, dx$$

On Beyond Average:

$$\int e^{2x} \cos(3x) \, dx =$$

$$\int x^5 \sin(x^3 - 1) \, dx =$$

Suppose $f(0) = 3$, $f(2) = 4$, and $\int_0^2 x^2 f(x) \, dx = 5$. What is $\int_0^2 x^3 f'(x) \, dx$?