1 8.1: Integration by Parts

Recall the Product Rule for Derivatives (use $u, vdu,$ and $dv$):

$$d(uv) =$$

Integrate both sides and solve for $u dv$:

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:

$$\int x \cos x \, dx =$$
\[
\int_0^1 x^2 e^{-2x} \, dx =
\]

\[
\int x^2 \ln x \, dx =
\]
\[ \int \tan^{-1} x \, dx \]

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

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

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