

# Integration

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# 1 Integration By Parts

Starting from the product rule

$$\frac{d}{dx}(f(x)g(x)) = f'(x)g(x) + f(x)g'(x)$$

if we integrate both parts we get

$$\begin{aligned} f(x)g(x) + C &= \int f'(x)g(x) dx + \int f(x)g'(x) dx \\ \int f(x)g'(x) dx &= f(x)g(x) + C - \int f'(x)g(x) dx \end{aligned}$$

Since the indefinite integral of  $f'(x)g(x)$  is equal to some function plus an arbitrary constant, we can ignore the  $+C$  term.

$$\int f(x)g'(x) dx = f(x)g(x) - \int f'(x)g(x) dx$$