
example

integration by parts

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Suppose we have the integrand xe^x and set $u = x, \quad v' = 1 \implies u' = 1, \quad v = e^x$

We now can calculate the integral as follows:

$$\int xe^x dx = \int uv' dx$$

$$= uv - \int u'v dx$$

$$= xe^x - \int e^x dx$$

$$= xe^x - e^x + C = e^x(x-1) + C$$

Use product rule for differentiation to check the result:

$$\frac{d}{dx}[e^x(x-1)] = \frac{d}{dx}[e^x] \cdot (x-1) + e^x \cdot \frac{d}{dx}[x-1]$$

$$= \frac{d}{dx}[e^x(x-1)] = e^x x - e^x + e^x = e^x x$$

integration by parts

exercise 5

Evaluate $\int_0^1 xe^x\,dx$