

Section 5.6: Integration by Parts

These notes reflect material from our text, *Calculus, Concepts and Contexts, Second Edition*, by James Stewart, published by Brooks/Cole, Pacific Grove, CA, 2001.

Key points from Stewart, Section 5.6: The technique of integration by parts.

Concepts

The **integration by parts** formula in its most succinct form is

$$\int u \, dv = uv - \int v \, du.$$

It is obtained by integrating the formula for the derivative of a product,

$$\frac{d}{dx}(uv) = u \frac{dv}{dx} + v \frac{du}{dx},$$

and then using the Fundamental Theorem of Calculus.

The corresponding formula for definite integrals, in a more expansive notation, is

$$\int_a^b u(x)v'(x) \, dx = u(x)v(x) \Big|_a^b - \int_a^b u'(x)v(x) \, dx.$$

Examples

$\int x \sin x \, dx$, $\int xe^x \, dx$, $\int \ln x \, dx$, $\int \arctan x \, dx$, $\int e^x \sin x \, dx$, $\int \sin^2 x \, dx$

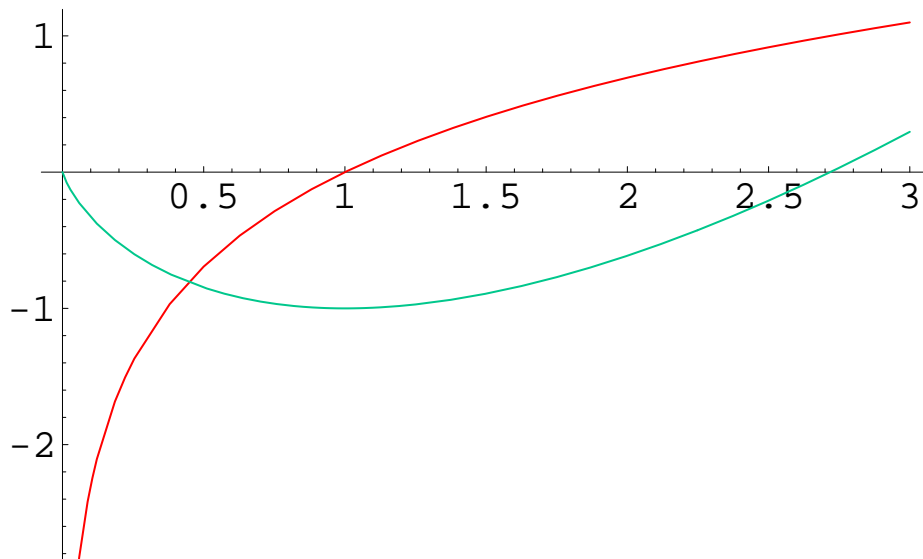


Fig. $\int \ln x \, dx = x \ln x - x$.

Exercises

Exercises for Section 5.6, pp 401–402: 2, 3, 9, 14, 19, 21, 25, 37, 41, 43