

MATH 155 - Chapter 8.2 - Integration by Parts

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1. Theorem: Integration by Parts

If u and v are functions of x and have continuous derivatives, then

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

2. Guidelines for Integration by Parts

1. Let dv = the most complicated part of the integrand that fits a basic integration rule. Then let u = remaining part.

2. Let u = the part of the integrand whose derivative is a function simpler than u . Then let dv = remaining part.

3. Common Integrals Using Integration by Parts:

1. Given $\int x^n e^{ax} dx$, $\int x^n \sin ax dx$, or $\int x^n \cos ax dx$

Let $u = x^n$; $dv = e^{ax} dx$, $\sin ax dx$, $\cos ax dx$.

2. Given $\int x^n \ln x dx$, $\int x^n \sin^{-1} ax dx$, or $\int x^n \tan^{-1} ax dx$

Let $u = \ln x$, $\sin^{-1} x$, $\tan^{-1} x$; $dv = x^n dx$.

3. Given $\int e^{ax} \sin bx dx$, $\int e^{ax} \cos bx dx$

Let $u = \sin bx$ or $\cos bx$; $dv = e^{ax} dx$. (We need to use the "combining the like terms"-method.)