Math 10B. Lecture Examples.

Section 7.2. Integration by parts[†]

Example 1   (a) **Find the antiderivative** $\int x \cos x \, dx$. **(b) Check the result by differentiation.**

Answer: (a) $\int x \cos x \, dx = x \sin x + \cos x + C$ **(b)** Product Rule: $\dfrac{d}{dx}(x \sin x + \cos x) = x \cos x$.

Example 2   **What is the area of the region between $y = xe^{-x}$ and the x-axis for $0 \le x \le 4$?**

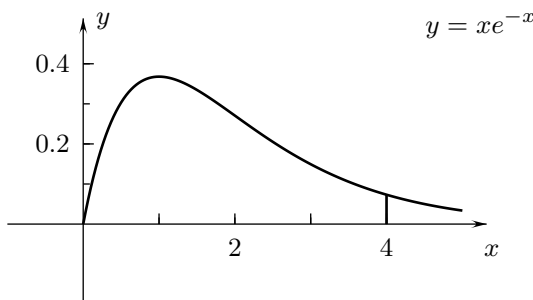**Answer:** Figure A2 ● [Area] $= 1 - 5e^{-4}$

Figure A2

Example 3   **Find the antiderivative $\int x^3 \ln x \, dx$.**

Answer: (a) $\int x^3 \ln x \, dx = \frac{1}{4}x^4 \ln x - \frac{1}{16}x^4 + C$

Example 4   **Evaluate $\int_1^5 \ln(2x) \, dx$.**

Answer: $\int_1^5 \ln(2x) \, dx = 5\ln(10) - \ln(2) - 4$

Example 5   **Find the indefinite integral $\int \dfrac{(\ln x)^4}{x} \, dx$.**

Answer: $\int \dfrac{(\ln x)^4}{x} \, dx = \frac{1}{5}(\ln x)^5 + C$

Interactive Examples

Work the following Interactive Examples on Shenk's web page, http//www.math.ucsd.edu/~ashenk/:[‡]

Section 8.1: Examples 1 and 2

[†]Lecture notes to accompany Section 7.2 of *Calculus* by Hughes-Hallett et al.

[‡]The chapter and section numbers on Shenk's web site refer to his calculus manuscript and not to the chapters and sections of the textbook for the course.