

MTH 252 Lab

Integration by Parts

Damien Adams

Purpose

There are several techniques of integration, and integration by parts is simply one of those techniques. Particularly, we use integration by parts to undo the product rule for differentiation. Moreover, we can use integration by parts to find antiderivatives for functions whose derivative is known to us.

- (a) Integration by parts is used to integrate a product of functions. What other integration strategy do you know that is used to integrate a product? Which one is typically easier?
- (b) When choosing u and dv in integration by parts, we typically choose dv as a function we know how to integrate, and we choose u to be a function that we know how to differentiate. Since logarithms are difficult to integrate, we usually choose u to be a logarithm, if a log is present. After that, polynomials are a good choice for u .

Prompts

1. Evaluate $\int y \sin y \, dy$.

2. Evaluate $\int x^2 \ln x \, dx$.

3. Evaluate $\int_0^{\frac{\pi}{4}} x \sec^2 x \, dx$.

4. Evaluate $\int e^y \sin(2y) \, dy$.

5. Evaluate $\int x^2 e^{x^3} \, dx$.

6. Consider $\int \cos \theta \sin \theta \, d\theta$.

- a. Evaluate the integral using substitution.
- b. Use a double-angle formula for sine to transform the integrand. Then use substitution to evaluate the integral.
- c. Use integration by parts to evaluate the integral.

7. Evaluate $\int_0^{15} \sqrt{225 - x^2} \, dx$.