

Integration by Parts, Part I

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Announcements

- 1 Homework in MyOpenMath.
- 2 Exams will be given back to you tomorrow.
- 3 Office hours, 10am - 11am.

Shifting gears

Today begins our study of new techniques of integration. After today's class, you be able to integrate something that looks like

$$\int x e^x dx$$

which currently we don't know how to handle.

The secret to integrating this and many other functions lies in a technique called _____. Integration by parts is the integration rule that corresponds to the product rule for differentiation, so let's remind ourselves of the product rule.

The product rule

If $f(x)$ and $g(x)$ are differentiable functions, then so is $f(x)g(x)$ and

If we integrate both sides of this, we get:

Rearranging this, we have one way of writing the integration by parts formula:

The product rule

The way this is usually written is as follows:

Matching corresponding pieces with the slide before, we have

with

This is not a _____.

This is simply a quick way to write out integration by parts.

Example

Find

$$\int x e^x dx$$

Example

How do I pick u and dv ?

A very natural question comes up when learning integration by parts: Which function should we make u and which one we should make dv ? Some books teach the following acronym: LIATE. How do we use this acronym? When you're deciding which function to make u , you're going to choose the function that appears furthest to the left in the acronym:

L
I
A
T
E

Example

Find

$$\int \ln(x) \, dx$$

Example

Example

Find

$$\int x^2 \sin(x) \, dx$$

Example