**TutorTube: Indefinite Integration by Parts** Fall 2020

**Introduction**

Hello and welcome to TutorTube, where The Learning Center’s Lead Tutors help you understand challenging course concepts with easy to understand videos. My name is Aima, Lead Tutor for MATH 1720. In today’s video, we will explore integration by parts. Let’s get started!

**Integration**

Before beginning integration by parts, you should be familiar with the term and the process of integration.

Integration is simply finding the antiderivative of a function.

Let's try a quick example before we continue:

Let us solve the following integral:

For this integral, we have simpler terms which when integrated, would result in the form . Where n is the respective power of each .

So, we apply that to each of the terms, multiplying each of the coefficients across them as so:

We can simplify this by canceling out terms of multiplication we appropriate, and we would now have a cleaned-up function as:

So we can finalize that

Now that we have attempted some integration examples, let’s go ahead and begin integration by parts.

**Integration by Parts**

Integration by parts is the process of finding the antiderivative of a function, by breaking the function into three major parts. This splitting of the function is performed to enable us find a solution to the problem. We would have to introduce two new variables, and which are both functions of , to be used in a special formula that is required to perform integration by parts:

Please take note that is derived from , while is gotten by integrating .

To use this formula to find solutions to integration by parts problems, we consider a method of hierarchy that lets us know which parts of the function can be assigned to first, before other parts can be assigned to . This is known as LIATE, where:

Using the information we just covered, let us try an example. Let us find the integral of ln ().

Because we cannot easily solve this type of problem, we would apply integration by parts.

We start by analyzing the function via the LIATE hierarchy.

* is a logarithmic function
* is the remaining part of the problem

The in the problem can be assigned to , since it is the first logarithmic function we have. Then, we can assign everything else to , and it would look like:

Now we solve for and :

If we place u, v, du, and dv in the formula, we have:

Now, we simplify the integral on the extreme right, and solve to get the solution:

Now, all we need to do is clean up the entire equation to get:

**Outro**

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