SAN JACINTO COLLEGE

STUDENT SUCCESS CENTER

Integration by Parts (Technique)

Integration by parts can seem very tricky, especially when you try to figure out how to solve it, but this acronym below will help you, along with the formula and a short example in this handout.

L: Logarithm
I: Inverse Trig
A: Algebraic
T: Trig (regular trig)
E: Exponential

formula: $\int udv = uv - \int vdu$

So you have an integration by parts problem, usually an integral that looks like something impossible to solve, for example, the problem below:

$$\int xln(x)dx$$

You will know that you have an integration by parts if you have not one, but **two possibilities** from the acronym. Now here is the catch, the acronym is in a proper order **(LIATE)**; you need to follow this order and remember it. In this kind of problem, **you will integrate and derive**. Here is where the order is important: we have **x**, and **ln(x)**; **x is algebraic and ln(x) is logarithmic**. Since the acronym L for logarithm comes before the acronym A for algebraic, we take the derivative **(du) of ln(x)**. For the other acronym that appears later, in this case A for algebraic, we integrate **x (dv).**

So again we have: $\int xln(x)dx$, using: $\int udv = uv - \int vdu$

We derive the logarithmic function based on the order of the acronym.

We integrate the algebraic function based on the order of the acronym.

u=ln(x)

dv=xdx

du= $\frac{1}{x}dx$

v= $\frac{x^2}{2}$

Since we have found all the parts, we plug it into the formula:

$$\int udv = uv - \int vdu$$

$$\int xln(x) = \frac{x^2 ln(x)}{2} - \int \frac{x^2}{2} * \frac{1}{x} dx$$

Now that we have something that makes a little more sense, we can see that the integral on the far right side following the subtraction sign is far easier to solve. The final result will be:

$$\int xln(x) = \frac{1}{2}\left[x^2 ln(x) - \frac{x^2}{2}\right]$$

Don't let integration by parts problems trip you up. If you remember the acronym (LIATE), you will be fine. You will face harder integration by parts problems where you will have to integrate by parts more than twice and at times, more than two times. Just remember, the concept/technique will be the same.