



Part 1 – Explore Integrating $\ln x$

Problem of the Day: $\int \ln x dx$.

One can quickly find the solution to the indefinite integral by entering in a CAS system. Do this now and complete the equation.

$$\int \ln x dx =$$

Yet, more important than the answer is how can we get it without the use of technology. List the techniques for integration that you know. Which technique will give a result similar to the one above?

Recall the formula for integration by parts: $\int uv' dx = uv - \int vu' dx$.

Make your choices for u and v' , calculate u' and v , and record the results below. Hint: when making your choice for u , remember the mnemonic device **LIPET**.

L – log (or natural log)

I – inverse

P – polynomial

E – exponential

T – trigonometric

$$u = \qquad \qquad \qquad u' =$$

$$v' = \qquad \qquad \qquad v =$$

Complete the process obtaining the result we got before.

Check your answer by differentiating the result.

Finally, confirm your solution graphically using the *Scratchpad*. Graph $y = \ln(x)$ and your result. With a partner, discuss how the two graphs relate to each other.

Part 2 – Extension/Homework

Integrate each of the following. Show all work. Verify your answers using the handheld.

1. $\int \tan^{-1} x dx$

2. $\int \ln(2x) dx$

3. $\int x e^x dx$

4. $\int x^2 e^x dx$

5. $\int x \sin x dx$