

8 Writing Assignment Due Thursday, March 26

Prompt. Why does u substitution work? That is, if you find a function $u(x)$, and rewrite

$$\int_a^b f(x)dx \quad \text{as} \quad \int_{u(a)}^{u(b)} g(u)du$$

why would the two areas be equivalent? Put another way, if $g(u(x))\frac{du}{dx} = f(x)$, why can we say that

$$\int_a^b f(x)dx = \int_{u(a)}^{u(b)} g(u)du?$$

I want you to explore this using your own words and your own creativity. Here are some things to (optionally) think about, but some things that will definitely help as you explore:

1. Can I use the Riemann sum interpretation of $x_i - x_{i-1} = \Delta x$ (the symbol that turns into dx) to understand the weird symbology

$$du = \frac{du}{dx}dx?$$

What would this have to do with Riemann sums in terms of $g(u)$ and du ? Would the Riemann sum using the “ u variable” use equal-width rectangles?

2. Is there any geometry going on?
3. Is the chain rule helpful at all? Why or why not?

Some guidelines. You *must* think for a long time to even begin to understand. I will repeat what I said above: **Spend at least two hours thinking and exploring** before you even begin to write your assignment.

Format. See online. Only PDF uploads are accepted on Canvas.