Math 199, Fall 2022
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Participation assignment 1 - The "anti" product rule

Estimated time: 30 minutes.

Point value: 3 points.

Goals: Understand where the method of integration by parts comes from and how to use it to compute integrals.

1) Write down an equation expressing the derivative of $f \cdot g$ in terms of f and g.
(*Hint:* the product rule.)

2) Take the (indefinite) integral of both sides of your equation in (1) to express $f \cdot g$ as a sum of two integrals.

3) Use your equation in (2) to express $\int f(x)g'(x)dx$ in terms of $f \cdot g$ and a different integral.

4) Explain what your answer to (3) means in your own words. How can you use this equation to help you compute certain integrals?

This method of integration is called **integration by parts**. Let's practice using it a little bit. Evaluate the following integrals using integration by parts.

5) $\int x \sin x dx =$

6) $\int_e^{e^2} \ln x dx =$

7) *(Bonus:)* $\int x^5 \sqrt{1+x^3} dx =$