

Math 1232: Single-Variable Calculus 2
George Washington University Spring 2026
Recitation 3

Jay Daigle

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Problem 1. Consider the integral $\int_e^{e^4} \frac{1}{x\sqrt{\ln x}} dx$.

- (a) We're going to have to do a u -substitution here. What u looks like it should work?
- (b) What do we need to change the bounds to when we do the u -substitution?
- (c) Compute $\int_e^{e^4} \frac{1}{x\sqrt{\ln x}} dx$.
- (d) Now try computing $\int \frac{1}{x\sqrt{\ln x}} dx$ to get the antiderivative.
- (e) Now plug e^4 and e in to your antiderivative. What do you notice? How is this related to part (c)?

Problem 2. Compute the following integrals.

- (a) $\int \frac{e^x}{1+e^x} dx$.
- (b) $\int \frac{\ln(x)}{x} dx$.

Problem 3 (Challenge). Compute $\int \frac{dx}{1+e^x}$.

Problem 4. (a) Compute $\sin(\arctan(5))$.

- (b) Compute $\frac{d}{dx} \arccos(\sqrt{x})$

- (c) Compute $\frac{d}{dx} \arctan(x + \sec(x))$

Problem 5. Compute the following integrals:

(a) $\int \frac{\arcsin(x)}{\sqrt{1-x^2}} dx.$

(b) $\int_0^1 \frac{e^{2x}}{1+e^{4x}} dx.$

Problem 6 (Completing the Square). Sometimes to do an inverse trig integral we need to *complete the square*. This is something you probably learned in high school then immediately forgot.

Let's say we want to compute $\int \frac{dx}{x^2-2x+2}.$

- (a) Is $x^2 - 2x + 2$ a perfect square?
- (b) We want to write $x^2 - 2x + 2$ in the form $u^2 + c$, where c is a constant. That means we need to find some other number a such that $x^2 - 2x + a$ is a perfect square. What value of a will work here?
- (c) Rewrite $x^2 - 2x + 2 = x^2 - 2x + a + b$, where a is the number you just found, and b is whatever's left over.
- (d) Set $u^2 = x^2 - 2x + a$, and complete your u -substitution.
- (e) Use that substitution and the derivative of \arctan to compute $\int \frac{dx}{x^2-2x+2}.$