Math 199, Fall 2023
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Participation assignment 12 - Antiderivatives

Estimated time: 30-50 minutes.

Point value: 3 points.

Goals: Start looking at some examples of antiderivatives, how to compute them in certain cases, and how to understand them.

1) Suppose $f'(x) = 0$. What could $f(x)$ be?

2) Suppose $f'(x) = g'(x)$, use problem (1) to conclude what $f(x) - g(x)$ can be.

3) If we know the derivative of a function, how much can we know (in theory) about the function itself? Use your answer to (2) to help analyze this.

4) To rephrase problem (3), how many antiderivatives does a general function have?

5) Let's get comfortable taking antiderivatives of some simple functions.

(a) Recall the power rule for taking derivatives:

$$\frac{d}{dx}x^n =$$

(b) Use this to find the "anti"-power rule:

$$\frac{d}{dx}\Big(\qquad\qquad\Big) = x^n$$

(c) Find an antiderivative of $f(x) = x^2 + 1$.

(d) Find an antiderivative of $f(x) = 3x^3 - \frac{1}{2}x^2 + x$.

(e) Find an antiderivative of $f(x) = (5x^3 + 3x - 2)x - \cos(x)$.

6) There is one value of n for which the "anti"-power rule doesn't give the correct answer. Which value is it, and what is the correct antiderivative for that value of n? *Hint:* There is also one value of n (not necessarily the same one) for which the ordinary power rule doesn't apply. Which one?

7) Find an antiderivative of $f(x) = e^x + \frac{2}{x} - \sin x$.

8) What is an antiderivative of $f(x) = 2^{3x}$?