

Homework 8

Calculus I, section 10

Due November 22, 2022 by 4:10 PM

As usual, you may use any resources to solve these problems except where stated otherwise, with the exception of computational software and posting these problems anywhere to be answered by others. Collaboration is encouraged, but everyone should write their own solutions. Write the names of any collaborators or sources used at the top of your homework. If you did not use any sources, write “sources used: none.”

If you find any errors in either the homework or the lecture notes, please let me know, even if you are unsure whether it is an error or not.

As on most math problems, the mathematics is the issue, not the answer: whether you have a correct method is more important than whether you get to the correct number at the end, so include your method!

You do not have to simplify your answers completely (so for example $\frac{2}{2}$ is fine), but you do need to do all the computations (so for example if the problem is “find the largest value of $f(x)$,” the answer “ $f(3)$ ” is incomplete; you would also need to evaluate f at 3).

Problem 1. Sketch the graph of $y = \frac{e^x}{x^2 - x - 2}$ without using a calculator or computer, using the method from class. Then look up what the graph actually looks like. How do they compare? If there are significant differences, what went wrong? See if you can fix them.

The above problem is primarily directed towards Objective 12 (assorted applications of differentiation).

Problem 2. Let $f(x) = x^2 - 2$. Use Newton’s method to get a numerical approximation to the positive solution of $f(x) = 0$, namely $\sqrt{2}$, to the nearest 0.001 (i.e. your answer should round to 1.414).

The above problem is primarily directed towards Objective 12 (assorted applications of differentiation).

Problem 3. Compute the left and right Riemann sums to approximate $\int_0^\pi \sin(x) dx$ for $N = 4$ (i.e. dividing the interval into 4 pieces).

The above problem is primarily directed towards Objective 13 (integrals: definitions).

Problem 4.

- Using the fact that $\frac{d}{dx}x^n = nx^{n-1}$ for every real number n , find an antiderivative for $f(x) = x^n$ where $n \neq -1$.
- Using the fact that $\frac{d}{dx} \sin(x) = \cos(x)$ and $\frac{d}{dx} \cos(x) = -\sin(x)$, find antiderivatives for $\sin(x)$ and $\cos(x)$.

The above problem is primarily directed towards Objective 13 (integrals: definitions).

Survey. Complete the following survey by rating each problem you attempted on a scale of 1 to 10 according to how interesting you found it (1 = “mind-numbing,” 10 = “mind-

blowing”), and how difficult you found it (1 = “trivial,” 10 = “brutal”). Also estimate the amount of time you spent on each problem to the nearest half hour.

	Interest	Difficulty	Time Spent
Problem 1			
Problem 2			
Problem 3			
Problem 4			