

Due Sunday, February 12, 2023 in Gradescope by 11:59 pm ET

Instructions:

- This is an Open Notes Quiz. You can use materials, homeworks problems, lecture notes, etc. that you manually worked on.
- This is **NOT** an Open Internet Quiz. You can only access our Main Course Webpage.
- You are not allowed to work on or discuss these problems with other students, professor, Math Fellow TA or simply put anyone.
- You can ask a few small, clarifying, questions in Office Hours, but the problems will not be solved for you.
- The main goal is to make a thoughtful and detailed presentation for the solutions. Submit a clear final draft. No mess please.
- Please submit your final work in Gradescope in the Quiz 2 entry.

1. [5 points each] Differentiate each of the following functions. Do **not** simplify your answers (a) and (b).

(a) $f(x) = \sqrt{\cos\left(3x^2 - \frac{1}{x^8}\right)}$

(b) $f(x) = \sin(x^2) \cdot \tan(3x)$

(c) Consider $f(x) = \sin^2 x + \cos^2 x$. Show that $f'(x) = 0$

2. [10 points] Consider $f(x) = \frac{\sin x}{1 + \cos x}$.

First, show that $f'(x) = \frac{1}{1 + \cos x}$. **Second**, show that $f'\left(\frac{\pi}{3}\right) = \boxed{\frac{2}{3}}$.

3. [10 points] The top of a ten foot ladder is sliding down a vertical wall at the rate of one foot every second. Consider the angle formed by the bottom of the ladder and the ground. How fast is this angle changing when the top of the ladder is five feet above the ground?

4. [10 points] Let $f(x) = \sin x + \cos(2x)$. Show that $f'\left(\frac{\pi}{6}\right) = \boxed{-\frac{\sqrt{3}}{2}}$.

DO NOT SPEAK TO ANYONE ELSE ABOUT THIS QUIZ