Math 106 OPTIONAL Take-Home Quiz #7

Due Sunday, April 19, 2026 in Gradescope by 11:59 pm

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 work in Gradescope in the OPTIONAL Quiz 7 entry.

1. [10 points each] Compute each of the following Integrals. Justify.

(a) $\displaystyle\int \frac{x^3}{5-x^4}\,dx$

(b) Show that $\displaystyle\int_0^{\ln 3} \frac{1}{e^{2x}\left(1+e^{-2x}\right)}\,dx = \boxed{-\frac{1}{2}\ln\left(\frac{5}{9}\right)}$

(c) Show that $\displaystyle\int_0^{\frac{\pi}{3}} \tan x\,dx = \boxed{\ln 2}$

(d) Show that $\displaystyle\int_{e^2}^{e^9} \frac{1}{x\sqrt{7+\ln x}}\,dx = \boxed{2}$

2. [10 points] Let $f(x) = \sin(\ln(1+7x)) - \ln(1+\cos(4x))$. Compute $f'(0)$.

3. [10 points] Compute $\dfrac{dy}{dx}$ where $y = (\cos x)^x$

DO NOT SPEAK TO ANYONE ELSE ABOUT THIS QUIZ