

# CALCULUS

## MINI EXAM 1 SECOND SECTION

NAME: \_\_\_\_\_

ID: \_\_\_\_\_

SCORE: \_\_\_\_\_ / 80

### RULES:

- You have 30 minutes to complete the exam.
- There are 3 questions and 80 points in total.
- You can use a non-graphing calculator.
- If you need to go to the restroom, please turn in your cellphone before.
- If you need hints, 1 hint is worth 3 points.

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*Date:* October 2, 2024.

*Problem 1* (20 points). (1) (10 points) Give a definition of derivative of a function  $f(x)$  at  $x = a$ .

(2) (10 points) Using the definition to compute the derivative of  $f(x) = x^3$  at  $x = 5$ . (You will get 0 point if you use power rule)

*Problem 2* (20 points).      (1) Find derivative of  $f(x) = \frac{x^3 + 4}{x^2 - 4x}$

(2) Find derivative of  $f(x) = (4 \sin x + 2)(2x^2 - 5)$

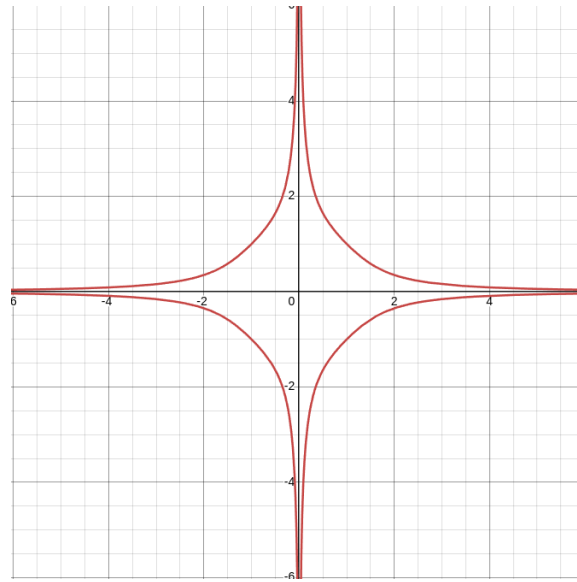
(3) Find second derivative of  $f(x) = \tan(2x) + x^2$

(4) Find second derivative of  $f(x) = (4x + 2)(2x^2 - 5)$

*Problem 3* (20 points).      (1) Find the limit  $\lim_{x \rightarrow \pi} \frac{x - \pi}{\sin(2x)}$

(2) Find the limit  $\lim_{x \rightarrow \infty} \frac{e^x}{x^5}$

*Problem 4* (20 points). The equation  $x^4y^2 + x^2y^4 = 2$  describes the following picture



Find the tangent line to this graph at the point  $(1, -1)$ .