CALCULUS

MINI EXAM 2
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.

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 $f(x) = \dfrac{x^3 + 4}{x^2 - 4x}$

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

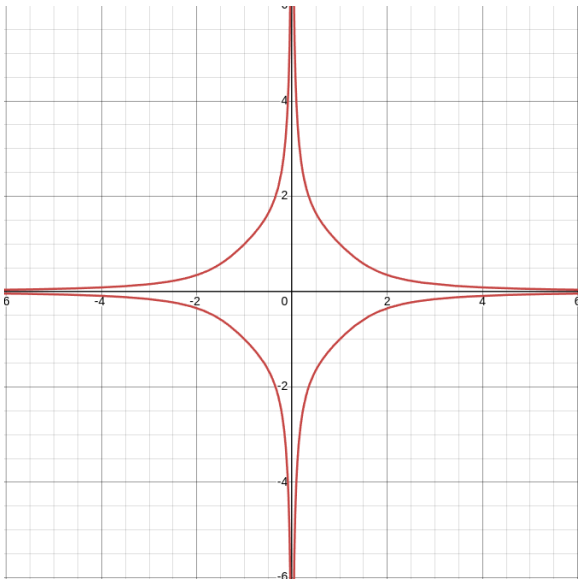
(3) Find second derivative of $f(x) = \tan(2x) + x^2$

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

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

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

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 $(1, -1)$.