Math 131-H – Calculus 1 Honors   **Name:** _____

Fall 2019

Midterm 1 (Practice)

4/10/19

Time Limit: 60 Minutes   **Section Time (9:05 or 10:10):** _____

This exam contains 5 pages (including this cover page) and 4 problems.

You may not use your books, notes, or a calculator on this exam.

You are required to show your work on each problem on this exam: an incorrect answer supported by substantially correct calculations or explanations may still receive partial credit.

Problem	Points	Score
1	12	
2	12	
3	10	
4	16	
Total:	50	

1. (12 points) Consider the function

$$f(x) = \begin{cases} 2x^2 & x < 0 \\ x^{5/2} & x \geq 0. \end{cases}$$

(a) (6 points) Is $f(x)$ differentiable at $x = 0$? Explain why or why not.

(b) (6 points) Is $f(x)$ twice differentiable at $x = 0$? Explain why or why not.

2. (12 points) Consider the function $f(x) = \frac{x^2+x}{2x^3-6x^2+4x}$.

    (a) (6 points) Find the locations of all the vertical asymptotes of the graph of $f(x)$. Justify your answer by computing a limit.

    (b) (6 points) Does $f(x)$ have a horizontal asymptote? If so, where? Justify your answer by computing a limit as $x \to \infty$.

3. (10 points) Consider the function $f(x) = 2x^2 + 1$.

    (a) (5 points) Use the limit definition of the derivative to find $f'(x)$.

    (b) (5 points) Find an equation for the line tangent to the graph of $y = f(x)$ at the point where $x = 3$.

4. (16 points) Find the derivative $f'(x)$ of the following functions.

   (a) (4 points) $f(x) = x^7 + 6x^3$.

   (b) (6 points) $f(x) = e^{x/2} \left(\sqrt{x} + \frac{1}{\sqrt{x}} \right)$.

   (c) (6 points) $f(x) = \frac{x^3 + 2x + 1}{4x^2 + 1}$.