

Your Name

Your Signature

Student ID #

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Problem	Total Points	Score
1	15	
2	7	
3	8	
4	10	
5	5	
6	5	
Total	50	

- This exam is closed book. You may use one $8\frac{1}{2} \times 11$ sheet of notes.
- Do not share notes.
- Only scientific calculators are allowed
- In order to receive credit, you must show your work. Do not do computations in your head. Instead, write them out on the exam paper.
- Place a box around **YOUR FINAL ANSWER** to each question.

- If you need more room, use the backs of the pages and indicate to the reader that you have done so.
- Raise your hand if you have a question.

1. Determine the following limits:

a) $\lim_{x \rightarrow 0} \frac{x + x^2}{\sqrt{1 + x + x^2} - \sqrt{1 - x - x^2}}$ (5 points)

b) $\lim_{x \rightarrow 0} \frac{\frac{3}{x} + \frac{5}{x(1+x)}}{\frac{5}{x} + \frac{3}{x(1-x)}} \quad (5 \text{ points})$

c) $\lim_{x \rightarrow \infty} \frac{\sqrt{9x^4 + 13x^2 + 1}}{x^2 + 27x + 1}$ (5 points)

2. Find the point at which the tangent to the curve $y = x + \frac{100}{x}$ ($x > 0$) is parallel to the x-axis. (7 points)

3. The distance of an object from the origin at time t is given by $s = \frac{1}{1+t} + \frac{t}{100} - 1$, find the instantaneous velocity at $t = 5$. Find the time when the instantaneous velocity is zero. Find the limiting velocity. (3+3+2 points)

4. Find $f'(x)$ using the definition of the derivative as a limit
- a) $f(x) = x\sqrt{x^2 + 17}$ (5 points)

b) $f(x) = \frac{e^x - 1}{e^x + 1}$ using the result that $\lim_{h \rightarrow 0} \frac{e^h - 1}{h} = 1$. (5 points)

5. For the following function find the points at which it is

a) not continuous, (3 points)

b) not differentiable. (2 points)

$$f(x) = \begin{cases} 1 - x^2, & x \leq 2 \\ -3, & 2 < x \leq 3 \\ x - 6, & 3 < x \leq 6 \\ x^2 - 35, & x > 6 \end{cases}$$

6. Draw an arrow connecting the graph of the function in the left column to the graph of its derivative in the right column. (5 points)

