

NAME _____

10-digit PUID _____

RECITATION INSTRUCTOR _____

RECITATION TIME _____

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TOTAL	/100

DIRECTIONS

1. Write your name, 10-digit PUID, recitation instructor's name and recitation time in the space provided above. Also write your name at the top of pages 2, 3 and 4.
2. The test has four (4) pages, including this one.
3. Write your answers in the boxes provided.
4. You must show sufficient work to justify all answers unless otherwise stated in the problem. Correct answers with inconsistent work may not be given credit.
5. Credit for each problem is given in parentheses in the left hand margin.
6. No books, notes, calculators or any electronic devices may be used on this exam.

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- (9) 1. Find the absolute maximum and absolute minimum values of the function $f(x) = \frac{x}{x^2 + 4}$ on the interval $[0, 4]$.

abs. max. $f() =$

abs. min. $f() =$

- (9) 2. Let $f(x) = 5 - x^{\frac{2}{3}}$ and note that $f(-1) = f(1) = 4$
 (a) Can you apply Rolle's theorem?

circle one YES NO

- (b) If your answer is YES, find a number $c \in (-1, 1)$ such that $f'(c) = 0$.
 If your answer is NO, explain.

(30) 3. Find each of the following as a real number, $+\infty$, $-\infty$, or write DNE (does not exist).

(a) $\lim_{x \rightarrow 0} \frac{e^x - 1 - x}{x^2}$.

(b) $\lim_{x \rightarrow \infty} (x e^{\frac{1}{x}} - x)$.

(c) $\lim_{x \rightarrow 0} \frac{\sin 5x}{\tan 3x}$.

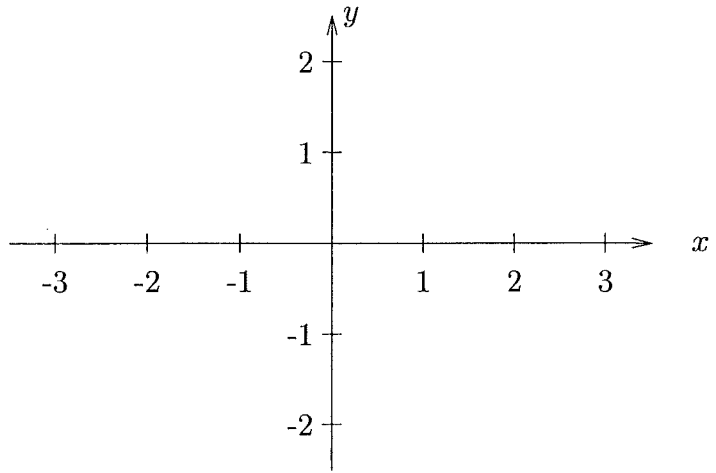
(d) $\lim_{x \rightarrow 0} \frac{\sin x - x}{x^3}$.

(e) $\lim_{x \rightarrow 0^+} (\csc x - \cot x)$.

(f) $\lim_{x \rightarrow 0} (1 - 3x)^{\frac{5}{x}}$.

(6) 4. If f' is continuous, $f(2) = 0$ and $f'(2) = 7$, find $\lim_{x \rightarrow 0} \frac{f(2 + 3x) + f(2 + 5x)}{x}$

- (16) 5. Let $f(x) = x - \ln x$. Give all the requested information and sketch the graph of the function on the axes below. Give both coordinates of the intercepts, local extrema and points of inflection, and give an equation for each asymptote. Write NONE where appropriate.



domain	
intercepts	
symmetry	
horizontal asymptotes	
vertical asymptotes	
intervals of increase	
intervals of decrease	
local maxima	
local minima	
intervals of concave down	
intervals of concave up	
points of inflection	

- (12) 6. Find the slope m of the line through the point $(3, 5)$ that cuts the least area from the first quadrant.

$m =$

- (12) 7. Find the x -coordinate of the points on the ellipse $4x^2 + y^2 = 4$ that are farthest from the point $(1, 0)$.

$x =$

- (6) 8. Find the function f such that $f'(x) = \frac{1}{x^2 + 1}$ and $f(-\sqrt{3}) = 1$.

$f(x) =$