

NAME _____

STUDENT ID _____

RECITATION INSTRUCTOR _____

RECITATION TIME _____

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DIRECTIONS

1. Write your name, student ID number, 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 or calculators may be used on this exam.

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

abs. max. $f() =$

abs. min. $f() =$

- (4) 2. Explain why the function $f(x) = x^{2/3}$ does not satisfy the hypotheses of the Mean Value Theorem on the interval $[-2, 3]$.
- (8) 3. Use calculus to find a positive number such that the sum of the number and its reciprocal is as small as possible.

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

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

(b) $\lim_{x \rightarrow 0} \frac{\sin^{-1} x}{x}$

(c) $\lim_{x \rightarrow \infty} (x - \sqrt{x^2 - 1})$

(d) $\lim_{x \rightarrow 0^+} (1 + x)^{1/x}$

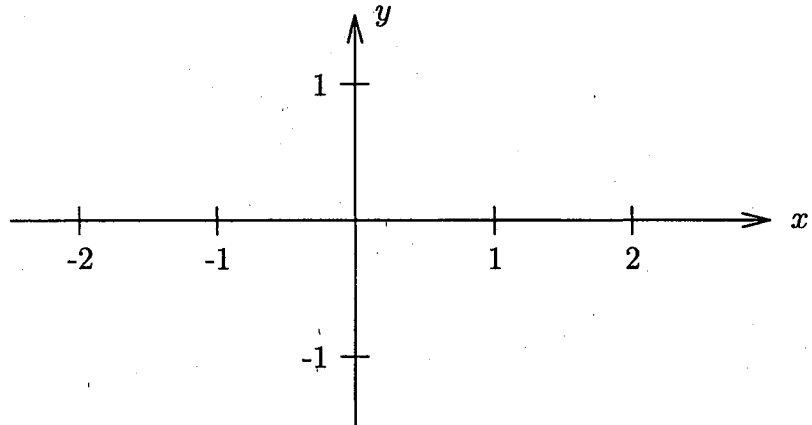
- (14) 5. The numbers 3 and -1 are critical numbers of the function $f(x) = 2x^5 - 5x^4 - 10x^3$. Showing all necessary work, decide whether f has a local maximum or a local minimum

(a) at 3 using the first derivative test,

(b) at -1 using the second derivative test.

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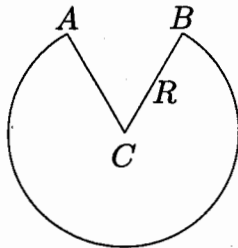
- (16) 6. Let $f(x) = \frac{1}{1 + e^{-x}}$. Give all the requested information and sketch the graph of the function on the axes below. Give both coordinates of the intercepts, local extrema and points of inflection, and give an equation for each asymptote. Write NONE where appropriate.



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	

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- (14) 7. A conical drinking cup is made from a circular piece of paper of radius R by cutting out a sector and joining the edges CA and CB. Find the maximum capacity of such a cup.



- (5) 8. Find the most general antiderivative of $f(x) = 5e^x - \frac{1}{1+x^2}$.

- (6) 9. Find $f(x)$ if $f'(x) = 2\sin x + \sec^2 x$ and $f(0) = 3$.

- (5) 10. If $\int_2^8 f(x)dx = 1.7$ and $\int_5^8 f(x)dx = 2.5$, find $\int_2^5 f(x)dx$.