

Math 221, Exam 1

Julie C. Mitchell

February 19, 2004

(1 point) Write your name -----

(1 point) Circle the name of your TA and time your class meets:

Seth Hain Rohini Kumar Jeremy Lanig Liming Lin John Neely Patrick Rault

7:45 9:55 11:00 12:05 1:20 2:25 3:30

- *For full credit, SHOW YOUR WORK and CIRCLE YOUR ANSWERS.*
- *NO calculators, NO notes, NO looking at your neighbor's paper.*

Problem	Points	Score
Name	1	
TA	1	
1	6	
2	10	
3	6	
4	6	
5	6	
6	10	
7	6	
8	12	
9	10	
10	16	
11	10	
Totals	100	

1. (6 points) For $f(x) = x^2 + x$ and $g(x) = \frac{2}{x+3}$, find each value.

(a) $(f - g)(2)$ (b) $(f \cdot g)(0)$ (c) $(g/f)(3)$

(d) $(f \circ g)(1)$ (e) $(g \circ f)(1)$ (f) $(g \circ g)(3)$

2. (10 points) Find the value of c for which the line $3x + cy = 5$

(a) passes through the point $(3,1)$

(b) is parallel to the y -axis

(c) is parallel to the line $2x + y = -1$

(d) has equal x and y -intercepts

(e) is perpendicular to the line $y - 2 = 3(x + 3)$

3. (6 points) Use the $\epsilon - \delta$ definition of the limit to prove $\lim_{x \rightarrow 0}(2x - 1) = -1$

4. (6 points) Calculate $\lim_{x \rightarrow 3^+} \frac{x-3}{\sqrt{x^2-9}}$ or state that it does not exist.

5. (6 points) Calculate $\lim_{x \rightarrow 0} \frac{\sin^2(3t)}{2t}$

6. (10 points) Calculate the following limits. Justify your answers.

(a) $\lim_{t \rightarrow -\infty} \frac{t^2}{7-t^2}$

(b) $\lim_{x \rightarrow \infty} \frac{x^3+x^2-x+1}{x^5-x^4+x^3-x^2+x+1}$

7. (6 points) Define $f(x) = \frac{x^3-1}{x-1}$ for $x \neq 1$. Can we define $f(1)$ so that the function f is continuous at $x = 1$? Justify your answer.

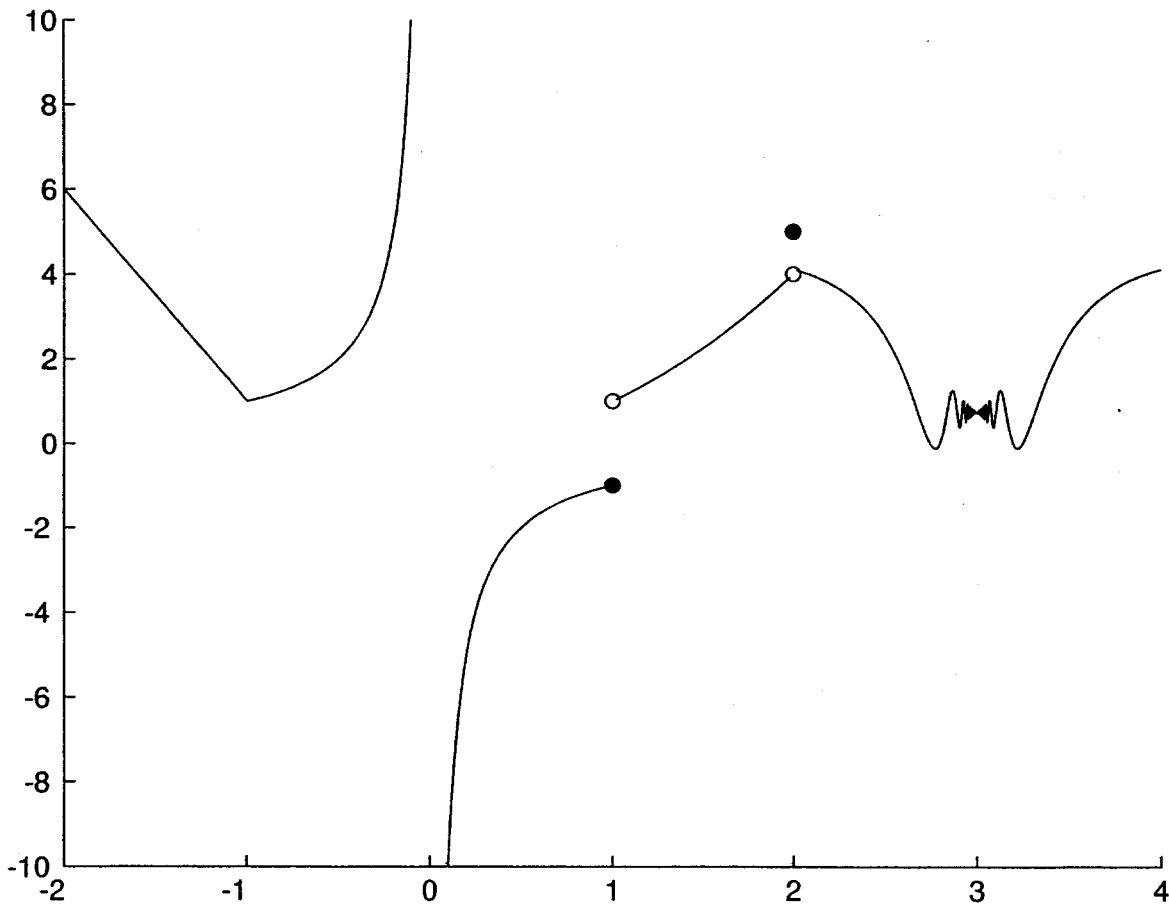
8. (12 points) Use $f'(c) = \lim_{h \rightarrow 0} \frac{f(c+h)-f(c)}{h}$ to calculate the derivative of

(a) $f(x) = 3x^2 + 4$

(b) $f(x) = x^2 + x + 1$

9. (10 points) Use the graph of $f(x)$ to determine the properties of f at the points given. For each point, write "Yes" or "No" in the box to indicate whether $f(x)$ has the property at the point $x = c$.

Point	$\lim_{x \rightarrow c} f(x)$ exists ($\neq \infty, -\infty$)	$\lim_{x \rightarrow c^+} f(x) = \infty$	Continuous	Differentiable
$c = -1$				
$c = 0$				
$c = 1$				
$c = 2$				
$c = 3$				



10. (16 points) Use the differentiation rules to calculate the following derivatives:

(a) $D_x y$ for $y = (x^2 + 2)(x^3 + 1)$

(b) $D_x y$ for $y = \frac{4}{2x^3 - 3x}$

(c) $D_x y$ for $y = \frac{2x^2 - 3x - 1}{2x + 1}$

(d) $D_x y$ for $y = \frac{\sin(x) + \cos(x)}{\tan(x)}$

11. (10 points)

(a) Find the equation of the tangent line to $y = x^2 - 2x + 2$ at the point $(1, 1)$.

(b) Graph this function for $-2 \leq x \leq 2$, and draw the tangent line at $x = 1$.