

Math 103

Exam # 1

Fall 2011

Name _____ (PRINT)

Recitation (circle one): 201 202 203 204
 205 206 207 208

This exam has 5 multiple choice questions, 1 open-ended question and 1 true/false question. Each question is worth 10 points for a total of 70 points. Some questions have two parts, in those cases each part is 5 points. Partial credit will be given for the entire exam so be sure to show all work. On the multiple choice, circle the correct answer and give supporting work, a correct answer with little or no supporting work will receive little or no credit. Use the space provided to show all work. A sheet of scrap paper is provided at the end of the exam. If you write on the back of any page please indicate this in some way.

You have **50 minutes** to complete the exam. You are not allowed the use of a calculator or any other electronic device. You are allowed to use the front and back of a standard 8.5"X11" sheet of paper for handwritten notes. Please silence and put away all cell phones and other electronic devices. When you finish, please stay seated until the entire 50 minutes has elapsed. When time is up continue to stay seated until someone comes by to collect your exam.

Do **NOT** write in the grid below. It is for grading purposes only.

Problem	Points
1	
2	
3	
4	
5	
6	
7	
Total	

1. Evaluate the following limits:

i) $\lim_{x \rightarrow 5} \left(\frac{1}{x-5} + \frac{1-2x}{x^2-x-20} \right)$

- | | |
|---------|-------------------|
| A) 0 | E) -1/10 |
| B) -1/7 | F) -1/11 |
| C) -1/8 | G) -1/12 |
| D) -1/9 | H) does not exist |

ii) $\lim_{x \rightarrow 3} \frac{\sqrt{x+6} - x}{x^3 - 3x^2}$

- | | |
|----------|-------------------|
| A) 0 | E) 1/10 |
| B) -5/9 | F) 1/6 |
| C) 5/9 | G) 1/2 |
| D) -5/54 | H) does not exist |

2. Decide whether the statement is true or false. If it is true explain why. If it is false explain why.

i)

If $f(x) = \sin(x^2)$, then $f''(\sqrt{\pi}) = -2$.

ii)

If the tangent line to the graph of $f(x)$ at $x = 4$ has equation $y = 3x - 14$, then $f(4) + f'(4) = -1$.

3. Find the values of a and b so that the function

$$f(x) = \begin{cases} -8\sqrt[3]{x} & x < -1 \\ ax^2 + x + 4 & -1 \leq x < 2 \\ 2^{x+b} - 6 & x \geq 2 \end{cases}$$

$a =$

A) 0 E) 4

B) 1 F) 5

C) 2 G) 6

D) 3 H) 7

$b =$

A) 0 E) 4

B) 1 F) 5

C) 2 G) 6

D) 3 H) 7

is continuous on $(-\infty, \infty)$.

4. Let $y = \sin(2x)\cos^2 x$. Find $y'\left(\frac{\pi}{4}\right)$.

A) -2

E) 0

B) $-\sqrt{2}$

F) 1

C) -1

G) 2

D) $\frac{-1}{2}$

H) $\frac{\sqrt{2}}{2}$

5. Find the value of a such that the tangent lines to

$$y = x^3 - 2x^2 + x + 1$$

at $x = a$ and $x = a + 1$ are parallel.

A) $\frac{1}{2}$

E) $\frac{1}{6}$

B) $-\frac{1}{2}$

F) 2

C) 1

G) 3

D) -2

H) None of these

6. If $f(x) = \frac{1+x^2}{1-x^2}$, then find the slope of the tangent line to the graph of f at the point $\left(\frac{1}{2}, \frac{5}{3}\right)$.

- | | |
|-------------------|-------------------|
| A) $\frac{1}{2}$ | E) $\frac{1}{3}$ |
| B) $-\frac{1}{2}$ | F) 8 |
| C) $\frac{9}{8}$ | G) $-\frac{7}{3}$ |
| D) 2 | H) $\frac{32}{9}$ |

7.

a. Let

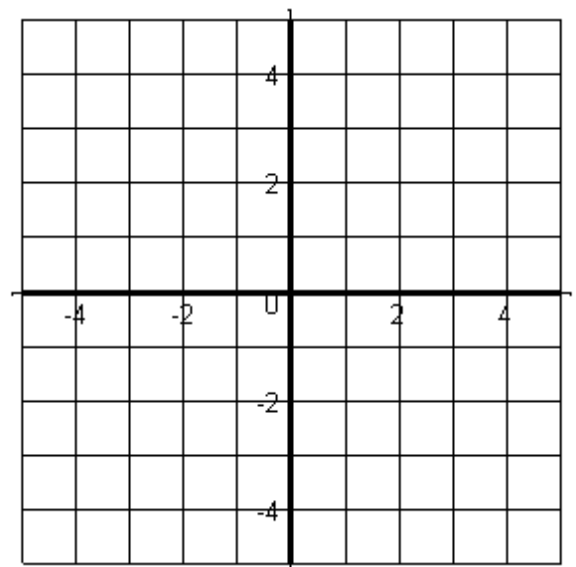
$$f(x) = \frac{1}{3x^2}$$

Find $f'(x)$ by using the limit definition of the derivative.

b. Sketch the graph of a function f that satisfies

$$\lim_{x \rightarrow 0^+} f(x) = -3, \quad \lim_{x \rightarrow 0^-} f(x) = 2, \quad f(0) = \frac{1}{2}$$

$$\lim_{x \rightarrow 3} f(x) = \infty, \quad \lim_{x \rightarrow \infty} f(x) = 0, \quad \lim_{x \rightarrow -\infty} f(x) = 1$$



Scrap Paper

If you use this page and intend for me to look at it, then you must indicate so on the page with the original problem on it. Make sure you label your work with the corresponding problem number.

Do **NOT** rip this page off.