Hour Exam 1

Math 3

Oct. 22, 2008

Name:_____

Instructor (circle): Mileti (8:45) Lahr (11:15) Elizalde (12:30)

Instructions: You are not allowed to use calculators, books, or notes of any kind. All your answers to the multiple choice questions must be marked on the Scantron form provided, and your responses to the remaining questions must be written in this exam booklet. Take a moment now to print your name and section clearly on your Scantron form, and on your exam booklet. With regard to the multiple choice questions, you may write on the exam, but you will only receive credit for what you write on the Scantron form. At the end of the exam you must turn in both your Scantron form, and your exam booklet. There are 10 multiple choice problems each worth 6 points, and there are 3 additional problems totaling 40 points. Check to see that you have 8 pages of questions plus this cover page.

Non-multliple choice questions:

Problem	Points	Score
1	15	
2	10	
3	15	
Total	40	

1. The limit

$$\lim_{x \to 2} \frac{|x-2|}{x-2}$$

is equal to

(a) ∞

(b) 0

(c) 1

(d) -1

(e) the limit does not exist.

2. The equation $3^x - 3x^2 + 1 = 0$ has

(a) No real solutions.

(b) Only one solution, which is in the interval $[-1, 0]$.

(c) Only one solution, which is in the interval $[0, 1]$.

(d) Only one solution, which is in the interval $[1, 2]$.

(e) Two or more solutions.

3. Let $f(x) = e^{x/3}$ and let $g(x) = \ln x - \ln 2$. The value of $(f \circ g)(16) = f(g(16))$ is

(a) 3

(b) 2

(c) e

(d) 14/3

(e) None of the above.

4. Assume that f is differentiable at x_0. The tangent line at the point $(x_0, f(x_0))$ is

(a) The line that intersects the graph of f only at the point $(x_0, f(x_0))$.

(b) The line passing through $(x_0, f(x_0))$ whose slope is the limit as h approaches 0 of the slope of the line passing through $(x_0, f(x_0))$ and $(x_0+h, f(x_0+h))$.

(c) The line passing through $(x_0, f(x_0))$ and $(x_0, f'(x_0))$.

(d) The line with equation $y = f'(x)$.

(e) The line with slope $\frac{\sin x_0}{\cos x_0}$.

5. For what real values of a is the function $f(x) = a^x$ increasing?

(a) Only for $a = e$.

(b) For every $a > 0$.

(c) For every $a \neq 0$.

(d) For every $a > 1$.

(e) For every real value of a.

6. The domain of the function $f(x) = \sqrt{3 - \sqrt{x-2}}$ is

(a) $[2, 3]$

(b) $[0, 3]$

(c) $[2, 11]$

(d) $[4, 9]$

(e) None of the above.

7. The function $f(x) = 3 - \sin(x^2)$ is

(a) even.

(b) odd.

(c) both even and odd.

(d) neither even nor odd.

8. The limit

$$\lim_{x \to \infty} \frac{x+2}{\sqrt{4x^2+1}}$$

is

(a) 0

(b) 1/4

(c) 1/2

(d) 1

(e) does not exist

9. The range of the function $f(x) = 3 + \cos(2x)$ is

(a) $[2, 4]$

(b) $[-1, 1]$

(c) $[-2, 2]$

(d) $(-\infty, \infty)$

(e) None of the above.

10. Suppose that an object moves along the x-axis in such a way that its position at time t (in seconds) is $x = t^4 + t$ meters to the right of the origin. The average velocity of the particle over the interval $[1, 2]$ is

(a) 5 meters/second

(b) 16 meters/second

(c) 19 meters/second

(d) 33 meters/second

(e) None of the above.

NON-MULTIPLE CHOICE. PLEASE SHOW ALL YOUR WORK.

1. Let

$$f(x) = \begin{cases} 4x + 1 & x \leq 1 \\ 2x^2 + kx & x > 1 \end{cases}$$

(a) (5 pts) Find the value of the constant k such that f is continuous at $x = 1$.

(b) (5 pts) For the value of k that you found in part (a), is f differentiable at $x = 1$? Explain your reasoning (no credit will be given without justification).

(c) (5 pts) Is there any value of k for which f is differentiable at $x = 1$?

2. Let

$$f(x) = \frac{3x - 4}{\sqrt{x^2 - 3}}.$$

(a) (5 pts) Find its derivative $f'(x)$.

(b) (5 pts) Find an equation of the tangent line to $f(x)$ at $x = 2$.

3. Let

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

Evaluate each of the following limits. Explain your answers!

(a) (5 pts) $\lim_{x \to 0} f(x)$

(a) (5 pts) $\lim_{x \to 1} f(x)$

(a) (5 pts) $\lim_{x \to \infty} f(x)$