Math 1426 **Fall 2007**

Midterm 2 – Version 1

Print your name legibly as it appears on the class rolls:

Last _____ First _____

ID Number: __ __ __ __ __ __ __ __ __ __

Check the appropriate section:

☐ **018 – Mr. Smith, MWF 8am**

☐ **021 – Dr. Shan**

☐ **024 – Mr. Smith, MW 1pm**

☐ **027 – Dr. Epperson**

☐ **030 – Mr. Martines**

☐ **032 – Dr. Krueger**

Write and bubble on your scantron

Name: **last name (space) first name** ⇐ **NOTE THE ORDER !!**
ID number: **begin in Column A and write all 10 digits**
Test No. **write 1 in Column K**
Section: **write your 3 digit section number in Columns L-N**

Turn cell phones off and put them out of sight. Turn off all beepers and alarms.

Do not write below this line

Part A total (48 points)	**Your score** 4× ____ =_____
13 (10 points)	
14 (11 points)	
15 (10 points)	
16 (10 points)	
17 (11 points)	
Part B total (52 points)	
Midterm 2 Total (100 points)	

The square brackets following an exam question number refer to a section/problem number in the text. Problems numbers preceded by the symbol ~ are modeled on that problem from the text, but not identical to it. Problems numbers without the symbol are identical to or very close to the problem from the text.

INSTRUCTIONS FOR PART A: Write your answers for these questions on the scantron provided and mark only one answer per question. **Scantrons will not be returned so mark your answers on your exam paper also; however, your grade will be determined solely by what you mark on your scantron.** Each of the questions in this part counts 4 points, for a total possible score of 48 points. You may use an approved calculator. You may write on this exam or request scratch paper if needed.

1. [2.2/38] Let $\lim_{x\to 1} h(x) = 5, \lim_{x\to 1} p(x) = 1,$ and $\lim_{x\to 1} r(x) = 2$. Find $\lim_{x\to 1} \dfrac{\sqrt{5h(x)}}{p(x)\left(4 - r(x)\right)}$.

   A. $\dfrac{5\sqrt{5}}{2}$ B. $\dfrac{\sqrt{5}}{2}$ C. $\dfrac{5}{2}$ D. 0 E. does not exist

2. [3.9] If x and y are functions of t, $x^2 + y^2 = 25,$ and $\dfrac{dx}{dt} = 4,$ find $\dfrac{dy}{dt}$ when $x = 3$ and $y > 0$.

   A. 4 B. −4 C. 3 D. −3 E. 1

3. [Lab3, 2.4, 2.5, Midterm 1] Suppose we know the following information about a continuous function f: the domain of f is $(-\infty, -1) \cup (1, \infty)$, $\lim_{x\to -\infty} f(x) = -5$; $\lim_{x\to 1^+} f(x) = -\infty$; and $\lim_{x\to +\infty} f(x) = 5$. How many asymptotes does f have?

   A. at least one vertical asymptote and exactly two horizontal asymptotes
   B. at least one vertical asymptote and only one horizontal asymptote
   C. exactly two vertical asymptotes and exactly two horizontal asymptotes
   D. exactly one vertical asymptote and exactly one horizontal asymptote
   E. no asymptotes

4. [2.5, 3.1] Which one of the following statements is NOT correct about the function $f(x) = \begin{cases} x^2, & x \ge 0 \\ \dfrac{x}{1000}, & x < 0 \end{cases}$?

   A. f is continuous at $x = 0$ B. $\lim_{x\to 0} f(x) = 0$ C. $\lim_{x\to -1^+} f(x) = -0.001$
   D. f is differentiable at $x = 0$ E. $\lim_{x\to 1^-} f(x) = 1$

5. [3.3/13] Had Galileo dropped a cannonball from the Tower of Pisa, 179 feet above the ground, the ball's height at time t sec would have been given by $h(t) = 179 - 16t^2$. At the moment the ball hit the ground, what would have been its velocity (rounded to the nearest whole number)?

   A. 107 ft/sec B. −107 ft/sec C. −107 ft/sec^2 D. 107 ft/sec^2
   E. -32 ft/sec^2

6. [3.4/16] Find $\dfrac{ds}{dt}$ if $s = \dfrac{\sin t}{1 - \cos t}$.

   A. $\dfrac{\cos t - \cos^2 t + \sin^2 t}{\left(1 - \cos t\right)^2}$ B. $-\dfrac{1}{\left(1 - \cos t\right)^2}$ C. $-\dfrac{1}{1 - \cos t}$
   D. $\cot t$ E. $\tan t$

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7. [3.5/70] Find the value of $(f \circ g)'(0)$ if $f(u) = u + \frac{1}{u^2}$ and $u = g(x) = 2x + 1$.

A. -2 B. -1 C. 0 D. 1 E. 2

8. [3.5/~Example 14] Find $\frac{dy}{dx}$ as a function of t for the parametric equations $x = \sin 3t$ and $y = \sin\left(\frac{3}{2}t\right)$.

A. $\frac{2\cos\left(\frac{3}{2}t\right)}{\cos 3t}$ B. $\frac{\cos 3t}{2\cos\left(\frac{3}{2}t\right)}$ C. $\frac{2\cos 3t}{\cos\left(\frac{3}{2}t\right)}$ D. $\frac{\cos\left(\frac{3}{2}t\right)}{\cos 3t}$

E. $\frac{\cos\left(\frac{3}{2}t\right)}{2\cos 3t}$

9. [4.1/51] Find where the extreme values of $f(x) = x \ln x$ occur.

A. f has an absolute maximum value at $x = 10,000$.

B. f has an absolute maximum value at $x = \frac{1}{e}$.

C. f has an absolute minimum value at $x = \frac{1}{e}$

D. f has an absolute minimum value at $x = \frac{1}{10,000}$.

E. f has no extreme values.

10. [3.8/89] Find $g'(x)$ if $g(x) = 2\tan^{-1}\sqrt{x}$.

A. $\frac{1}{1+x^2}$ B. $-\frac{\csc^2\sqrt{x}}{\sqrt{x}}$ C. $\frac{1}{\sqrt{x+1}}$ D. $\frac{1}{\sqrt{x}(1+x)}$

E. $\frac{\sec x \tan x}{\sqrt{x}}$

11. [3.10/~2] Find the linearization of $f(x) = \frac{1}{\sqrt{1+2x}}$ at $x = 0$.

A. $L(x) = 0$ B. $L(x) = 1 + 2x$ C. $L(x) = 1$

D. $L(x) = \sqrt{1+2x}$ E. $L(x) = 1 - x$

12. [4.2/5-8] Which of the following functions satisfy the hypotheses of the Mean Value Theorem ?

I. $f(x) = x^{2/3}$ on the interval $[-1, 8]$

II. $f(x) = x^{4/5}$ on the interval $[0, 1]$

III. $f(x) = \sqrt{x(1-x)}$ on the interval $[0, 1]$

IV. $f(x) = \begin{cases} \frac{\sin x}{x} \text{ if } -\pi \le x < 0 \\ 0 \text{ if } x = 0 \end{cases}$

A. III and IV only B. II and III only C. I, II, III only
D. I, II, IV only E. I, II, III and IV

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INSTRUCTIONS FOR PART B: For these questions, you must write down **all** steps in your solutions. Write legibly and carefully label any graphs or pictures. **Draw a box around your solution.** Partial credit will be given for those parts of your solution that are correct. The total value of the questions in this section is 52 points.

13. **10 points** [3.7/~93] Find $\frac{dy}{dx}$ if $y = x^{\sin x}$.

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14. **11 points** [3.6/60&63] Given that y is a function of x, find $\left.\frac{d^2y}{dx^2}\right|_{x=2}$ if $y^2 - 2x^2 - 4y + 3 = 0$ and $y > 0$.

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15. **10 points** [3.7 & Midterm 1] Does the graph of the function $f(x) = \ln\sqrt{\frac{2x^3}{3} + 4x - \pi}$ have any horizontal tangent lines? If so, find the x-coordinate at each point where the tangent line is horizontal. If there are no horizontal tangent lines, explain why.

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16. **10 points** [4.1/35] Find the absolute maximum and minimum values of $f(x) = x^{4/3}$ on the interval $[-1, 8]$.

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17. **11 points** [3.9/23] A balloon is rising vertically above a level, straight road at a constant rate of 1 ft/sec. Just when the balloon is 65 ft above the ground, a bicycle moving a constant rate of 17 ft/sec passes under it. How fast is the distance between the bicycle and the balloon increasing 3 sec later?

END OF EXAM