Math 1426 **Midterm 2 – Version A** **Fall 2008**

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

Last _____ First _____

ID Number: 1 0 0 0 __ __ __ __ __ __

►**Check the appropriate section:**

☐ 001 – Dr. Krueger

☐ 004 – Dr. Shan

☐ 007 – Dr. Jorgensen

☐ 010 – Dr. Epperson

☐ 013 – Mr. Clanton

►►►►►Fill in your scantron exactly as below◄ ◄◄◄◄

NAME	Last, first (EXACTLY AS YOU WROTE ABOVE)		
SUBJECT	1426- YOUR SECTION #	TEST NO.	2A
DATE		PERIOD	

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

►**Do not write below this line**

Part I total (48 points)	Your score 4× _____ =_____
13 (10 points)	
14 (10 points)	
15 (10 points)	
16 (10 points)	
17 (12 points)	
Part II total (52 points)	
Midterm 2 Total (100 points)	

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

INSTRUCTIONS FOR PART I: Write your answers for these questions on a scantron (form 882-E or 882-ES) 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. [2.6/~36] Which of the following defines $g(3)$ in a way that makes $g(x)=\dfrac{2x^2-2x-12}{3x^2-6x-9}$ continuous at $x=3$?

   (a) $g(3)=\dfrac{5}{6}$ (b) $g(3)=0$ (c) $g(3)=3$ (d) $g(3)=\dfrac{4}{3}$ (e) $g(3)=\dfrac{2}{3}$

2. [2.7] If $\lim\limits_{h\to 0}\dfrac{f(x_0+h)-f(x_0)}{h}=0$, which of the following is NOT possible?

   (a) f has a horizontal tangent at $x=x_0$ (b) f is defined at $x=x_0$

   (c) f is continuous at $x=x_0$ (d) f has a cusp at $x=x_0$

   (e) f does not have a vertical asymptote at $x=x_0$

3. [3.1/~35] For the function $f(x)=\begin{cases} x^2 & \text{if } x<0 \\ x & \text{if } x\geq 0 \end{cases}$, which of the following statements are TRUE?

   I. The left-hand derivative of f at $x=0$ is 0.
   II. The right-hand derivative of f at $x=0$ is 1.
   III. f is differentiable at $x=0$.
   IV. f is continuous at $x=0$.

   (a) I and II only (b) II and III only (c) II and IV only (d) III and IV only
   (e) I, II, IV only

4. [3.2/~39] The functions f and g and their first derivatives are defined for all real numbers. Their values at 0 and 2 are given in the table. If $h(x)=f(x)\,g(x)$, compute $h'(0)$.

x	$f(x)$	$g(x)$	$f'(x)$	$g'(x)$
0	3	4	−2	1
2	1	6	0	2

   (a) −11 (b) −5 (c) −2 (d) 2 (e) 14

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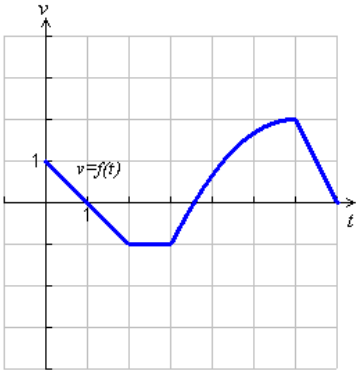
5. [3.2/~39] Referring to the table in Question 4, if $h(x)=\dfrac{f(x)}{g(x)}$, compute $h'(0)$.

(a) $-\dfrac{11}{16}$ (b) $\dfrac{3}{4}$ (c) $-\dfrac{5}{16}$ (d) $-\dfrac{3}{2}$ (e) 0

6. [3.3 ~18] The figure below shows the velocity $v=f(t)$ of a particle moving on a coordinate line. Which of the following are TRUE?



I. the particle is moving backwards for $t\in(0,2)$

II. the particle's acceleration is positive for $t\in(3,6)$

III. the particle is at rest for $t\in(2,3)$

IV. the particle is moving forward for $t\in(4,7)$

V. the particle is speeding up for $t\in(1,2)$

(a) I & II only (b) II & IV only (c) IV only (d) II, IV, V only
(e) II, III, IV, V only

7. [3.3 ~10] A rock thrown vertically upward from the surface of the earth at a velocity of 128 ft/sec reaches a height of $s(t)=128t-16t^2$ ft in t seconds. What is the total distance traveled by the rock from $t=2$ to $t=5$?

(a) 32 ft (b) 48 ft (c) 80 ft (d) 192 ft (e) 240 ft

8. [3.4/13] Find $\dfrac{ds}{dt}$ if $s=\tan t-e^{-t}$.

(a) $\sec t\tan t+e^{-t}$ (b) $\sec^2 t+e^{-t}$ (c) $\sec^2 t-te^{-t}$ (d) $\cot t\csc^2 t-e^{-t}$
(e) $\sec^2 t+e^{-t-1}$

9. [3.5, 3.7/~39] Find $f'(x)$ if $f(x)=\ln(\sqrt{x^2+1})$

(a) $\dfrac{1}{\sqrt{x^2+1}}$ (b) $\dfrac{1}{2(x^2+1)}$ (c) $\dfrac{2}{x^2+1}$ (d) $\dfrac{2x}{\sqrt{x^2+1}}$ (e) $\dfrac{x}{x^2+1}$

10. [3.6/39] Find $\dfrac{dy}{dx}$ if $y=(2x+5)^{-1/2}$.

(a) $-(2x+5)^{-3/2}$ (b) $-2(2x+5)^{-3/2}$ (c) $(2x+5)^{-3/2}$ (d) $2^{-1/2}$ (e) $-\dfrac{1}{2}(2x+5)^{-3/2}$

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11. [3.7] Suppose that we know that functions $f(x)$ and $f^{-1}(x)$ are differentiable. The values of $f(x)$, $f'(x)$, and $f^{-1}(x)$ at 0 and 2 are given in the table. Find $\left(f^{-1}\right)'(0)$.

x	$f(x)$	$f'(x)$	$f^{-1}(x)$
0	4	6	2
2	8	5	1

(a) $\frac{1}{8}$ (b) $\frac{1}{6}$ (c) $\frac{1}{5}$ (d) $\frac{1}{4}$ (e) $\frac{1}{2}$

12. [3.8 #34] Evaluate $\tan\left(\cos^{-1}(x)\right)$.

(a) $\frac{x}{\sqrt{1-x^2}}$ (b) $\frac{\sqrt{1-x^2}}{x}$ (c) $\sin x$ (d) $\sin^{-1} x$ (e) x

INSTRUCTIONS FOR PART II: 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 final answer.** 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. **10pts** [2.6/~40; 3.4/~48, 3.1/Theorem1] Let $g(x)=\begin{cases} x+b & x<0 \\ \cos x & x\geq 0 \end{cases}$.

(a) Is there a value of *b* that will make *g* continuous at $x=0$? Give reasons for your answer.

(b) If $b=2$, is *g* differentiable at $x=0$? Give reasons for your answer.

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14. **10 pts** [3.5/~103, 3.8] For the parametric equations $x = \tan^{-1} t$, $y = \sqrt{t}$, find the value of $\left.\frac{d^2y}{dx^2}\right|_{t=1/4}$.

    Do NOT eliminate the parameter to solve this problem.

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15. **10 pts** [3.6/~48] For the curve given by $x^2 + y^2 = 25$, find equations for the tangent line and the normal line to the curve at the point $(3, -4)$.

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16. **10 pts** [3.7/~95] Find $\frac{dy}{dx}$ if $y = x^{\ln\sqrt{x}}$.

17. **12 pts** [3.9/~Example 4] A tank is in the shape of a cone with a circular base. The tank stands point down and has a base radius of 5 ft and a height of 20 ft. Water is running out of the bottom of the tank at the constant rate of 20 ft^3/min. How fast is the water level falling when the water is 8 ft deep?

Note: The volume of a cone with a circular base is given by the formula $V = \frac{1}{3}\pi r^2 h$.

END OF EXAM

If your scratch paper contains any work to be graded, INDICATE THAT ON THE EXAM BESIDE THE APPROPRIATE PROBLEM and ask proctor to attach scratch paper to the exam.