

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

Last \_\_\_\_\_ First \_\_\_\_\_

ID Number: \_ \_ \_ \_ \_

Check the appropriate section:

- 001 – Dr. Shan
- 004 – Dr. Krueger
- 007 – Mr. Smith
- 010 – Mr. Martines
- 013 – Dr. Lin

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 (11 points)	
16 (10 points)	
17 (11 points)	
Part II 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. 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. [2.5/19b] Find  $\lim_{x \rightarrow 0^+} \left( \frac{x^2}{2} - \frac{1}{x} \right)$ .

- A. 0                      B. -1                      C.  $\infty$                       D.  $-\infty$                       E.  $-\frac{1}{2}$

2. [2.6/~35] Let  $f(x) = \begin{cases} \frac{x^2 - 9}{x - 3}, & x \neq 3 \\ k, & x = 3 \end{cases}$ . If possible, find a value for  $k$  so that  $f$  is

continuous for all real numbers.

- A. -6                      B. 6                      C. 0                      D. 3  
E. no such  $k$  exists

3. [2.7/26] Find an equation of the line with slope  $\frac{1}{4}$  that is tangent to the curve

$$y = \sqrt{x}.$$

- A.  $x - 4y - 12 = 0$                       B.  $x + 4y - 4 = 0$                       C.  $x - 4y + 12 = 0$   
D.  $x + 4y + 12 = 0$                       E.  $x - 4y + 4 = 0$

4. [3.3/~7] At time  $t$ , the position of a body moving along the  $x$ -axis is  $s = 2t^3 - 9t^2 + 12t$ . Find the total distance traveled by the body from  $t = 0$  to  $t = 3$ .

- A. 11                      B. 9                      C. 12                      D. 8                      E. 0

5. [3.4/13, 3.5] Find  $\frac{ds}{dt}$  if  $s = \tan t - e^{-t}$ .

- A.  $\cot t + e^{-t}$                       B.  $\csc^2 t - e^{-t}$                       C.  $\sec^2 t - e^{-t}$   
D.  $\sec^2 t + e^{-t}$                       E.  $\csc^2 t + e^{-t}$

**CONTINUE TO THE NEXT PAGE**

6. [3.5, 3.7/~39] Find  $f'(x)$  if  $f(x) = \ln(\sqrt{x^2+1})$

A.  $\frac{x}{x^2+1}$

B.  $\frac{1}{\sqrt{x^2+1}}$

C.  $\frac{1}{2(x^2+1)}$

D.  $\frac{2}{x^2+1}$

E.  $\frac{2x}{\sqrt{x^2+1}}$

7. [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  $(f^{-1})'(0)$ .

$x$	$f(x)$	$f'(x)$	$f^{-1}(x)$
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.  $\frac{1}{2}$

8. [3.5, 3.8/~52] Find the derivative of  $y = -\sin^{-1}(7x^2 - 2)$ .

A.  $\frac{-14x}{\sqrt{1-(7x^2-2)^2}}$

B.  $\frac{14x}{1+(7x^2-2)^2}$

C.  $\frac{7}{\sqrt{1+(7x^2-2)^2}}$

D.  $\frac{14x}{\sqrt{1-(7x^2-2)^2}}$

E.  $\cos^{-1}(7x^2 - 2)$

9. [3.5, 3.8/~59] Evaluate  $\frac{d}{dx}(\tan^{-1}\sqrt{3x})$ .

A.  $\frac{1}{\sqrt{1-3x}}$

B.  $\frac{3}{2(1+3x)\sqrt{3x}}$

C.  $\frac{1}{6\sqrt{3x(1+3x)}}$

D.  $\frac{1}{1+3x}$

E.  $\frac{1}{1+9x^2}$

**CONTINUE TO THE NEXT PAGE**

10. [3.9/1] Suppose that the radius  $r$  and the area  $A = \pi r^2$  of a circle are differentiable functions of  $t$ . Find  $\frac{dA}{dt}$ , the rate of change of the area, at  $r = 10$  ft if the rate of change of the radius,  $\frac{dr}{dt}$ , is 3 ft/min.
- A.  $30\pi$  ft<sup>2</sup>/min      B.  $6\pi$  ft<sup>2</sup>/min      C.  $60$  ft<sup>2</sup>/min  
D.  $60\pi$  ft<sup>2</sup>/min      E.  $20\pi$  ft<sup>2</sup>/min
11. [3.10/49] Use differentials to estimate the change in volume  $V = \pi r^2 h$  of a right circular cylinder when the radius changes from 10 in to 10.1 in and height does not change.
- A.  $100\pi h$  in<sup>3</sup>      B.  $100\pi$  in<sup>3</sup>      C.  $102.01\pi h$  in<sup>3</sup>  
D.  $2\pi h$  in<sup>3</sup>      E.  $2\pi$  in<sup>3</sup>
12. [4.1/~39] Find the absolute minimum of  $f(x) = x^2 - 8x$  on the interval  $(-\infty, 8]$ .
- A.  $(-4, 16)$       B.  $(4, -16)$       C.  $(8, 0)$       D.  $(0, 8)$   
E. there is no absolute minimum

**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. **10 pts** [3.4] Show that the tangent lines to the curve  $y = \frac{\pi \sin x}{x}$  at  $x = \pi$  and  $x = -\pi$  intersect at right angles.

**CONTINUE TO THE NEXT PAGE**

14. **10 pts** [3.5/ Example 14] Find  $\frac{d^2y}{dx^2}$  as a function of  $t$  for the parametric equations

$$x = t - t^2$$

$$y = t - t^3$$

---

15. **11 pts** [3.6/55] Find an equation of the tangent line to the curve  $x^2 \cos^2 y - \sin y = 0$  at the point  $(0, \pi)$ .

**CONTINUE TO THE NEXT PAGE**

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

---

17. **11 pts** [4.3/Example 1] Find the critical points of  $f(x) = x^3 - 12x - 5$  and identify the intervals on which  $f$  is increasing and the intervals on which  $f$  is decreasing.

### END OF EXAM

If additional sheets of paper are to be graded, ask proctor about attaching them to the exam. Have you shown all work in Part II? Fill in your scantron form as instructed on the front page. Write name & indicate course section on the front page.