

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

******WRITE THIS ON YOUR SCANTRON ******

Name: Last, first ← **NOTE THE ORDER !!**
 Subject: 1426 - __ (fill in your section number on your scantron)
 Test No. A

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 (11 points)	
14 (10 points)	
15 (10 points)	
16 (10 points)	
17 (11 points)	
Part II total (52 points)	
Midterm 1 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. [2.1/32] Find the **average** rate of change of the function $g(t) = 2 + \cos t$ over the interval $[0, \pi]$.

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

2. [2.2/~Example 3] Determine the value of the limit $\lim_{x \rightarrow 3} \sqrt{\frac{x^2 - 2x - 3}{x - 3}}$, if it exists.

A. 4 B. 2 C. ± 2 D. ± 4 E. does not exist

3. [2.4/8] Let $f(x) = \begin{cases} 1 - x^2 & \text{if } x \neq 1 \\ 2 & \text{if } x = 1 \end{cases}$. Which of the following statements are true?

I. $\lim_{x \rightarrow 1^-} f(x) = 1$ II. $\lim_{x \rightarrow 1^-} f(x) = 0$
 III. $\lim_{x \rightarrow 1^+} f(x) = 1$ IV. $\lim_{x \rightarrow 1^+} f(x) = 2$
 V. $\lim_{x \rightarrow 1} f(x) = 0$ VI. $\lim_{x \rightarrow 1} f(x)$ does not exist

A. I & III only B. II, IV, & VI only C. II & V only
 D. III & VI only E. II & IV only

4. [2.4/~29] Find $\lim_{x \rightarrow 0} \frac{\sin x \cos 4x}{x + x \cos 5x}$.

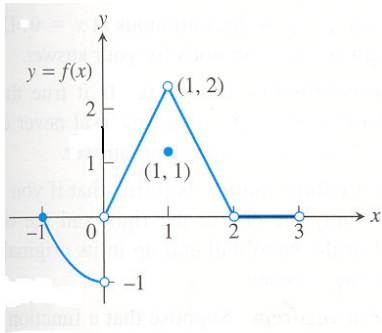
A. $\frac{1}{2}$ B. $\frac{4}{5}$ C. 0 D. 1 E. does not exist

5. [2.5/22c] Find $\lim_{x \rightarrow 0^-} \frac{x^2 - 3x + 2}{x^3 - 4x}$.

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

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6. [2.6/5-10 & Lab 2] The graph of a function $y = f(x)$ is shown below. Determine which of the statements I-IV are true.



- I. $\lim_{x \rightarrow -1^+} f(x) = f(-1)$
- II. f is right-continuous at $x = -1$
- III. $\lim_{x \rightarrow 1} f(x) = f(1)$
- IV. f is continuous at $x = 1$

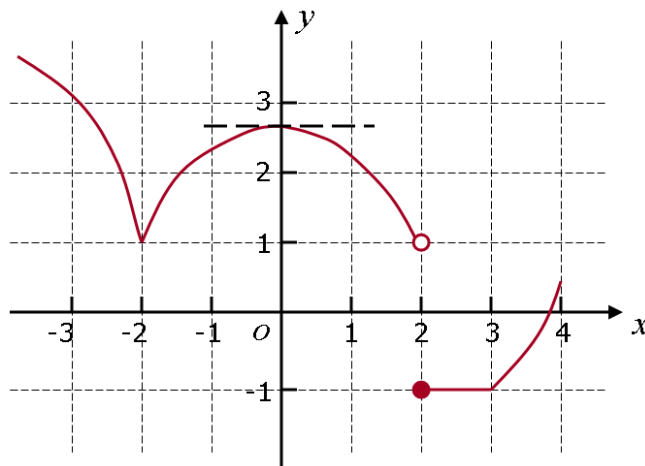
- A. I, II, III and IV
- B. III and IV only
- C. I and III only
- D. I and II only
- E. II and IV only

7. [2.7/~23] Determine the number of horizontal tangent lines for the graph of the function

$$f(x) = 5x + \frac{3}{2}x^2 + \frac{2}{3}x^3.$$

- A. 1
- B. 2
- C. 3
- D. 4
- E. 0

8. [3.1] Suppose that the function $y = f(x)$ has the graph below. Determine which of the statements I-V are true.



- I. f is continuous at $x = -2$
- II. $f'(0) = 0$ and $f'(3) = 0$
- III. $\lim_{x \rightarrow 2} f(x) = -1$
- IV. $\lim_{h \rightarrow 0} \frac{f(-2+h) - f(-2)}{h}$ does not exist
- V. $\lim_{h \rightarrow 0^+} \frac{f(2+h) - f(2)}{h} = 0$

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

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9. [2.7, 3.1] The functions f and its first derivative are defined on $(-\infty, +\infty)$. Their values at 0 and 1 are given in the table. Find the equation of the tangent line to the graph of $y = f(x)$ at the point with x -coordinate 1.

x	$f(x)$	$f'(x)$
0	1	6
1	2	4

- A. $y = 6$ B. $y = 6x + 1$
 C. $4x - y - 7 = 0$ D. $x - 2y - 4 = 0$
 E. $y = 4x - 2$

10. [2.6, 3.1] Using the table of the previous question, determine which one of the following statements is NOT correct about function $f(x)$.

- A. $\lim_{h \rightarrow 0} \frac{f(h) - 1}{h} = 6$ B. f has a horizontal tangent line at $x = 0$
 C. $\lim_{x \rightarrow 0} f(x) = 1$ D. f is continuous at $x = 0$
 E. f is differentiable at $x = 0$

11. [3.2/35] Find $\frac{dz}{dx}$ for $z = 2x^2e^x$.

- A. $\frac{dz}{dx} = 4xe^x + 2x^2e^x$ B. $\frac{dz}{dx} = 4xe^x - 2x^2e^x$ C. $\frac{dz}{dx} = 2xe^x + 2x^2e^x$
 D. $\frac{dz}{dx} = 2xe^x + 4x^2e^x$ E. $\frac{dz}{dx} = 4xe^x$

12. [3.2/~20] Find $\frac{dy}{dx}$ for $y = \frac{x^2 + 2x - 2}{x^2 - 2x + 2}$.

- A. $\frac{dy}{dx} = \frac{4x^2 + 8x}{(x^2 - 2x + 2)^2}$ B. $\frac{dy}{dx} = \frac{4x^2 - 8x}{(x^2 - 2x + 2)^2}$ C. $\frac{dy}{dx} = \frac{-4x^2 + 8x}{(x^2 - 2x + 2)^2}$
 D. $\frac{dy}{dx} = \frac{-4x^2 - 8x}{(x^2 - 2x + 2)^2}$ E. $\frac{dy}{dx} = \frac{2x + 2}{2x - 2}$

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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. **11 pts** [2.7/~11, ~23, ~26]

(a) Find the slope of the tangent line to $f(x) = x^2 - 3x$ at $x = 3$.

(b) Show that the graph of $y = f(x)$ has only one horizontal tangent line and find its equation.

(c) Find a point on the graph of $y = f(x)$ where the tangent line is parallel to the graph of the line $3x + y = 11$.

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14. **10 pts** [2.4/33] Evaluate $\lim_{\theta \rightarrow 0} \frac{\sin \theta}{\sin 2\theta}$.

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15. **10 pts** [2.5/31] For the function $f(x) = \frac{x+3}{x+2}$, find the equations of **all** asymptotes.

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16. **10 pts** [2.6/~39] Determine a value for the constant c that makes $f(x) = \begin{cases} cx+1 & \text{if } x \leq 3 \\ cx^2-1 & \text{if } x > 3 \end{cases}$ continuous for all real numbers. Be sure to explain why f is continuous for **all** real numbers.

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17. **11 pts**[3.1~6] Use the definition of the derivative to show that $f'(x) = \frac{1}{2\sqrt{x-1}}$ when $f(x) = \sqrt{x-1}$.

END OF EXAM

If additional sheets of paper are to be graded, ask the 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.