

Midterm 1 – 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, first name
 ID number: begin in Column A
 Test No. write 1 in Column K
 Section: write your section in Columns K-M

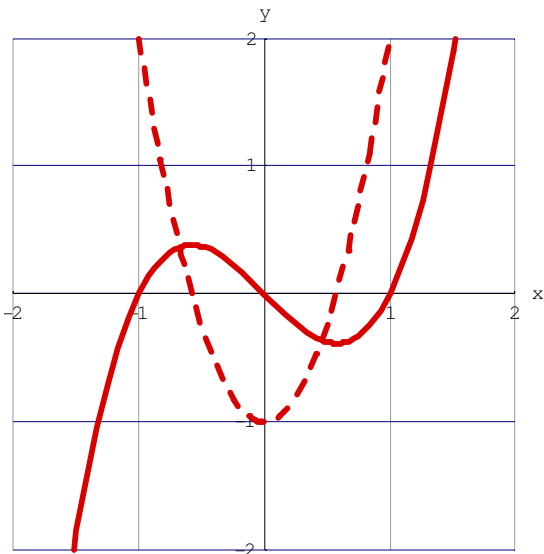
Do not write below this line

Part A total (48 points)	Your score 4 × ____ = ____
13 (10 points)	
14 (10 points)	
15 (10 points)	
16 (10 points)	
17 (12 points)	
Part B total (52 points)	
Midterm 1 Total (100 points)	

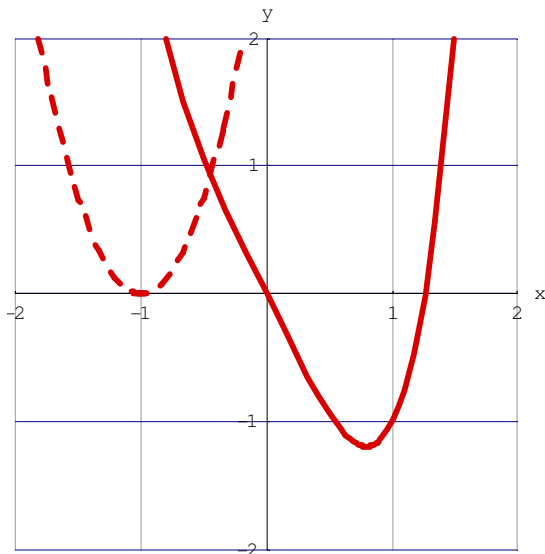
The square brackets following an exam question number refer to a section/problem number in the text. Problems numbers preceded by the symbol ~ are modeled on that problem from the text, but not identical to it. Problems numbers without the symbol are identical to or very close to the problem from the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

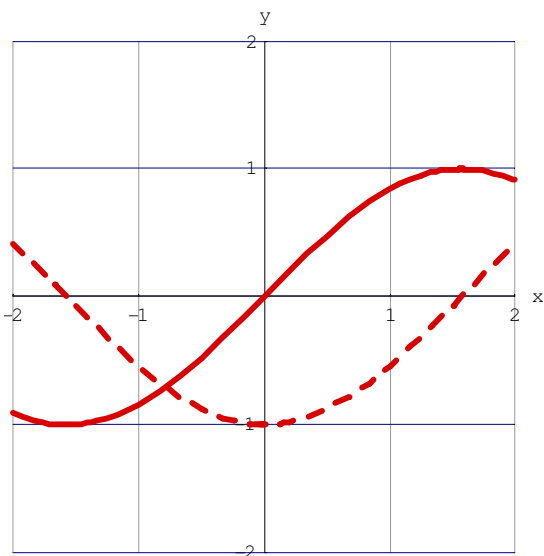
1. [3.1/~28] Which figure shows the graph of a function (solid line) and its derivative (dashed line)?



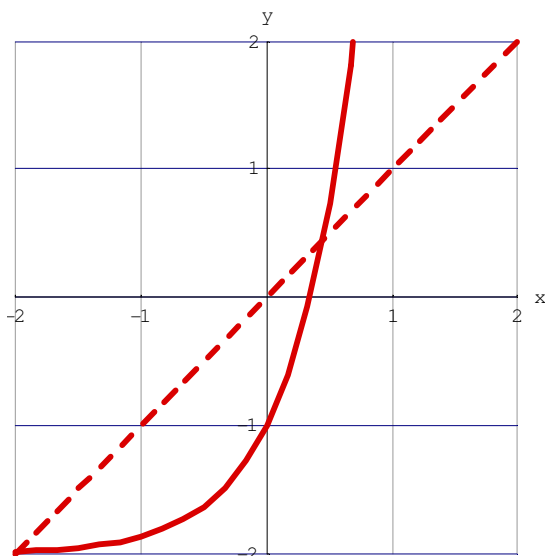
A.



B.



C.



D.

2. [2.7, 3.1] The function f and its first derivative are defined for all real numbers. Their values at 0 and 1 are given in the table.

x	$f(x)$	$f'(x)$
0	2	4
1	1	5

Find an equation of the tangent line to the graph of $y = f(x)$ at a point with x -coordinate 1.

- A. $y = 5x - 6$ B. $5x - y + 4 = 0$ C. $5x - y + 5 = 0$
D. $x - 5y - 4 = 0$ E. $y = 5x - 4$

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3. [2.5, 3.1] Which one of the following statements is NOT correct about the function $f(x) = |x - 2|$?
- A. f is continuous at $x = 2$ B. $\lim_{x \rightarrow 0} f(x) = 2$ C. $\lim_{x \rightarrow 2} f(x) = 0$
D. f is differentiable at $x = 2$. E. $\lim_{x \rightarrow 3^-} f(x) = 1$

4. [2.6/~5-10] Let f be the function defined by

$$f(x) = \begin{cases} \sin x & \text{if } x < 0 \\ x^2 & \text{if } 0 \leq x < 1 \\ 2 - x & \text{if } 1 \leq x < 2 \\ \frac{x^2 - 3x}{x} & \text{if } x \geq 2 \end{cases}$$

For what values of x is f NOT continuous?

- A. 0 only B. 1 only C. 2 only D. 0 and 2 only E. 0, 1 and 2
5. [2.5/Lab 3/B1] Evaluate $\lim_{x \rightarrow \infty} \frac{6x - 2}{\sqrt{9x^2 + 30}}$.
- A. $\frac{6}{9}$ B. 0 C. ∞ D. 2 E. $\frac{2\sqrt{3}}{3}$
6. [3.2/~Example 4] For which of the following functions is $y^{(4)} = 0$?
- A. $y = e^x$ B. $y = x^4$ C. $y = e^x + e^{-x}$ D. $y = x^3 - 3x^2 + 2$
E. $y = x^3 - \sqrt{x}$

7. [3.2/17] Find the derivative of $y = \frac{2x + 5}{3x - 2}$.

A. $\frac{dy}{dx} = \frac{19}{9x^2 - 12x + 4}$ B. $\frac{dy}{dx} = \frac{-19}{4x^2 + 20x + 25}$ C. $\frac{dy}{dx} = \frac{-19}{9x^2 - 12x + 4}$
D. $\frac{dy}{dx} = \frac{19}{4x^2 + 20x + 25}$ E. $\frac{dy}{dx} = \frac{2}{3}$

8. [3.2/~35] If $w(z) = 3z^2 e^z$, find $w'(1)$.

A. $w'(1) = 6e$ B. $w'(1) = 9e$ C. $w'(1) = 3e$ D. $w'(1) = 3 + 6e$
E. $w'(1) = 3$

9. [2.2/57] If $\lim_{x \rightarrow 2} \frac{f(x) - 5}{x - 2} = 1$, find $\lim_{x \rightarrow 2} f(x)$.

A. 5 B. 1 C. 0 D. ∞ E. does not exist

10. [2.2/~40] Suppose $\lim_{x \rightarrow b} f(x) = 7$ and $\lim_{x \rightarrow b} g(x) = -3$. Find $\lim_{x \rightarrow b} \frac{g(x)}{f(x) - 1}$.

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

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11. [Lab3, 2.4, 2.5] How many asymptotes does the graph of $f(x) = \frac{3x-2}{\sqrt{2x^2-30}}$ have?
- A. One vertical and one horizontal B. Two vertical and two horizontal
C. One vertical and two horizontal D. Two vertical and one horizontal
E. None

12. [2.5/26] Evaluate $\lim_{x \rightarrow 0} \left(\frac{3}{x^3} - \frac{4}{x^4} \right)$.
- A. 0 B. 1 C. ∞ D. $-\infty$ E. does not exist

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** [3.2/~Example 6] Does the curve $y = \frac{2x^3}{3} + 4x - \pi$ have any horizontal tangents? If so, find the x -coordinate of each point for which the curve has a horizontal tangent. If not, justify why not.

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14. **10 points** [3.1/~6] Use the definition of the derivative to show that $f'(x) = \frac{1}{2\sqrt{x-1}}$ when $f(x) = \sqrt{x-1}$.

15. **10 points** [2.6/~40] Find constants a and b such that f is continuous at $x = 1$ where

$$f(x) = \begin{cases} x^2 - 4x + b + 3 & \text{if } x < 1 \\ 3 & \text{if } x = 1 \\ ax + b & \text{if } x > 1 \end{cases}$$

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16. **10 points** [2.2/31] Find the following limit using the algebraic techniques of Chapter 2.
No credit will be given for any other method of solution.

$$\lim_{x \rightarrow 1} \frac{x-1}{\sqrt{x+3}-2}$$

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17. **12 points** [Lab 3] Sketch the graph of **one** function that satisfies **all** the following conditions:
- (a) domain $(-\infty, -1) \cup (1, \infty)$
 - (b) vertical asymptote at $x = -1$
 - (c) horizontal asymptote at $y = 5$
 - (d) $\lim_{x \rightarrow 1^+} f(x) = -\infty$
 - (e) $\lim_{x \rightarrow -\infty} f(x) = -5$
 - (f) the only x -intercept is $\frac{7}{5}$.

END OF EXAM