PARTIAL SOLUTION SHEET

PRINT YOUR NAME LEGIBLY AS IT APPEARS ON CLASS ROLL

LAST name:_____ FIRST name:_____

MAV ID NUMBER: (10 digits) _____

CHECK THE APPROPRIATE SECTION

☐ Dr. Ambartsoumian Section 002

☐ Dr. Epperson Section 004

☐ Dr. Krueger Section 012

☐ Dr. Shan Section 014

☐ Mr. Smith Section 003

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& PUT THEM OUT OF SIGHT

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	Points Earned
Part I (48 points)	$\cdot 4 =$
13 (10 points)	
14 (11 points)	
15 (11 points)	
16 (10 points)	
17 (10 points)	
PART II (52 points)	
TOTAL SCORE (100 points)	

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1. [§3.5] Given that $f'(x) = \sqrt{3x+4}$ and $g(x) = x^2 - 1$, find $\dfrac{d}{dx}\Big[f(g(x))\Big]$.

   (a) $2x\sqrt{3x+4}$ (b) $2\sqrt{3x^2+1}$ [(c)] $2x\sqrt{3x^2+1}$ (d) $\dfrac{3x}{\sqrt{3x+4}}$ (e) $\dfrac{3}{2\sqrt{3x+4}}$.

2. [§3.5] Find $f'(3x)$ if $\dfrac{d}{dx}\Big[f(3x)\Big] = 6x$.

   (a) 0 (b) $\dfrac{x}{2}$ (c) $\dfrac{2}{x}$ (d) x^2 [(e)] $2x$.

3. [§4.3:$\sim$Example 6] Suppose that f is defined on $(-\infty, \infty)$, and that $x = -2$ and $x = 1$ are critical numbers for f. If $f''(x) = 2x + 1$, then

   (a) f has a relative minimum at $x = -2$ and a relative maximum at $x = 1$

   [(b)] f has a relative maximum at $x = -2$ and a relative minimum at $x = 1$

   (c) f has relative maxima at both $x = -2$ and $x = 1$.

   (d) f has relative minima at both $x = -2$ and $x = 1$.

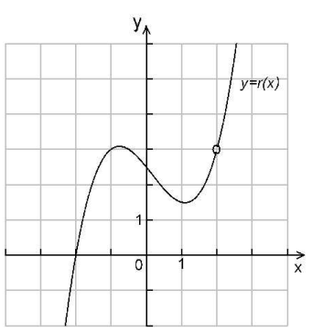
   (e) f has no relative extrema.

4. [§2.2:Lab2] For a constant c, let $f(x) = \dfrac{x-c}{|x-c|}$. Which one of the following is TRUE?

   (a) $\lim\limits_{x\to c^+} f(x) = -1$ (b) $\lim\limits_{x\to c} f(x) = 1$ (c) $\lim\limits_{x\to c^-} f(x) = 1$

   [(d)] $\lim\limits_{x\to c^+} f(x) = 1$ (e) $\lim\limits_{x\to c} f(x) = 0$.

5. [§2.2] Given the graph (shown) of a rational function, $y = r(x)$, which one of the following holds?



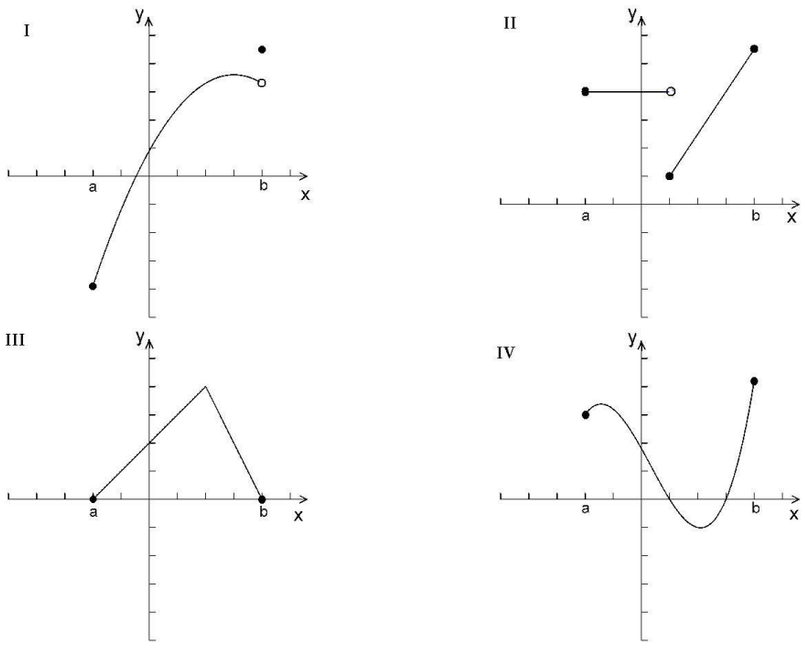
   [(a)] $x - 2$ is a factor of both the numerator and denominator of r (b) $\lim\limits_{x\to 2} r(x)$ does not exist

   (c) $\lim\limits_{x\to 3} r(x) = 3$ (d) $x - 2$ is a factor of only the denominator of r (e) $\lim\limits_{x\to 2} r(x) = 0$.

6. [§3.7:3] Let x and y denote differentiable functions of t. If $5x^2 - y = 100$ and $\dfrac{dx}{dt} = 10$, find $\dfrac{dy}{dt}$ when $x = 10$.

(a) 100 [(b)] 1000 (c) 0 (d) 900 (e) 10.

7. [§4.2:∼21] Which of the following graphs depicts a function that satisfies the hypotheses of the Mean Value Theorem on the interval $[a,\ b]$?



(a) III & IV only (b) I only [(c)] IV only (d) I & II only (e) III only.

8. [§2.3:∼16] Let a denote a nonzero constant. Determine a real number b, if possible, so that the function $f(x) = \begin{cases} \dfrac{x^2 - a^2}{x - a} & \text{if } x \neq a \\ b & \text{if } x = a \end{cases}$ is continuous at $x = a$.

(a) $b = -a$ (b) $b = a$ (c) $b = 0$ [(d)] $b = 2a$ (e) no such b is possible.

9. [§3.6:∼9] Given $\cos^2(x+y) = xy$, an acceptable intermediate step when computing $\dfrac{dy}{dx}$ implicitly is

[(a)] $2(\cos(x+y))(-\sin(x+y))\dfrac{d}{dx}(x+y) = y + x\dfrac{dy}{dx}$ (b) $2(\cos(x+y))\dfrac{d}{dx}(x+y) = y + x\dfrac{dy}{dx}$

(c) $2(\cos(x+y))\left(1 + \dfrac{dy}{dx}\right) = y + x\dfrac{dy}{dx}$ (d) $2(\cos(x+y))(-\sin(x+y))\left(1 + \dfrac{dy}{dx}\right) = y + x$

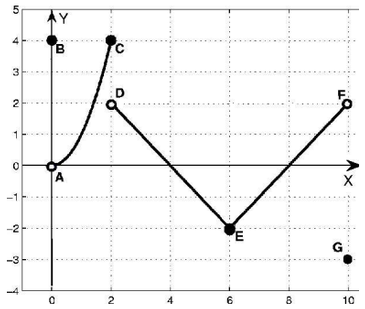
(e) $\sin^2(x+y) = \dfrac{dy}{dx}$.

10. [§3.8:∼pg 165] The linearization of $f(x) = \dfrac{3}{\sqrt{x-3}}$ near $x = 5$ (that is, a linear function that can be used to approximate $f(x) = \dfrac{3}{\sqrt{x-3}}$ near $x = 5$) is given by

(a) $f(5)f'(5)(x-5)$ [(b)] $\dfrac{3}{\sqrt{2}} - \dfrac{3}{4\sqrt{2}}(x-5)$ (c) $f(5) + f'(5)(x-3)$

(d) $\dfrac{3}{\sqrt{2}} - \dfrac{3}{4}(x-5)$ (e) $f'(5)x$.

11. [§4.1:∼Example 1] The graph of a function f is shown. Find <u>all</u> the points where f has an absolute (global) extremum.



(a) E only (b) B, C, E & G only (c) C & E only [(d)] B, C & G only (e) B & G only.

12. [§3.2,3.3,3.5] The functions f and g and their first derivatives, f' and g', are defined on $(-\infty, +\infty)$; their values at 0 and $\frac{\pi}{2}$ are given in the table:

x	$f(x)$	$g(x)$	$f'(x)$	$g'(x)$
0	4	6	-2	9
$\frac{\pi}{2}$	3	-1	0	5

If $H(x) = f(\sin 2x)\, g(\cos 3x)$, compute $H'\left(\frac{\pi}{2}\right)$.

(a) -18 (b) -84 (c) 48 (d) 24 [(e)] 132.

INSTRUCTIONS FOR PART II For these questions, you must write down **<u>all</u>** steps in your solutions **<u>as if you do not have a calculator</u>**. Write legibly, and **<u>label any graphs or pictures</u>**. Draw a box around your solution. Partial credit will be given for those parts of your solution that are correct. Total possible score for this part is 52 points.

13. [§4.3] [10 points] Sketch the graph of a function f that has <u>all</u> of the following properties: the domain of f is $(-\infty, +\infty)$, $f(-1) = 4$, $f(1) = 0$, $f'(-1) = 0$, $f'(1)$ does not exist, $f'(x) < 0$ if $|x| < 1$, $f'(x) > 0$ if $|x| > 1$, $f''(x) < 0$ if $x \neq 1$.

(Recall the instructions above pertaining to graphs.)

14. [§3.7] [11 points] A 13-ft ladder is leaning against a house when its base starts to slide away. By the time the base is 12 ft from the house, the base is moving at the rate 5 ft/sec. At what rate is the angle between the ladder and the ground changing at that moment?

15. [§3.6:∼39-42] [11 points] Let a denote a nonzero constant. Using implicit differentiation, find the equation of the tangent line to the curve given by $x^{2/3} + y^{2/3} = a^{2/3}$ at $(a,\ 0)$.

16. [§3.8:∼20] [10 points] Using differentials, estimate $\sqrt{\sin\left(\frac{\pi}{6}+0.1\right)}$.

17. [§4.1:∼29] [10 points] Find the absolute minimum and absolute maximum of the function

$$f(x)=\begin{cases} 3 & \text{if } x<0 \\ x^2-4x+3 & \text{if } x\geq 0 \end{cases} \qquad \text{on the interval } [-2,\ 5].$$

If additional sheets of paper are to be graded, ask proctor about attaching them to the exam.

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Write name & indicate course section on page 0 & on page 1.

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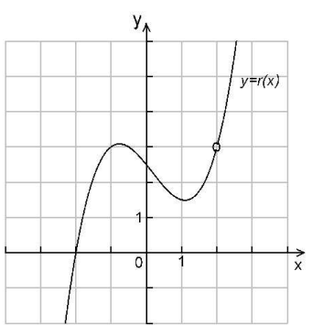

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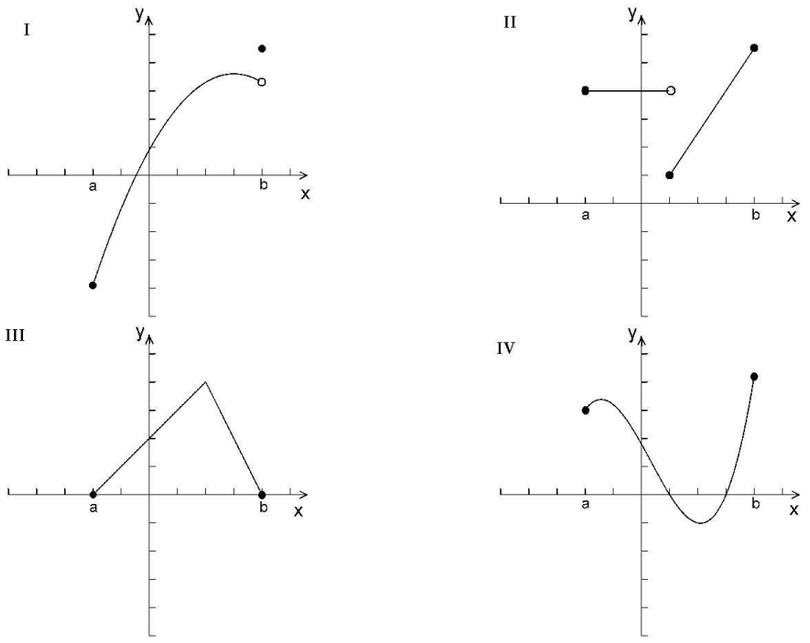

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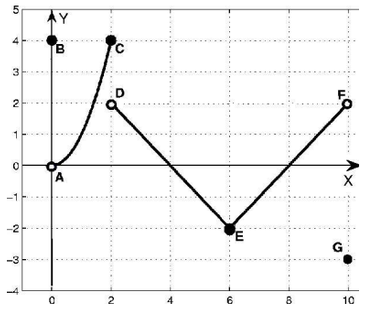

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