1. Let , .

 a. (5 pts) Find the intervals on which is increasing or decreasing.

 b. (5 pts) Find the (x,y) coordinates of any local maximum or minimum point(s) of . Justify your answer(s).

2. Suppose is a function whose second derivative given by ,

 a. (3 pts) Find the interval(s) on which  is concave up or concave down.

 b. (2 pts) Find the of the inflection points.

3. Evaluate each limit. State the indeterminate form at each step when using L’Hospital’s Rule. Simplify your answers!

 a. (5 pts) 

 b. (5 pts)  Hint: 

4. (10 pts) A function  is continuous and has the following properties. Sketch a graph of .

 **Properties:**,, is undefined,, and the **signs** of and  given **below.**

 4

 2

     2 3

 

    

 

   

  

 

 

5. The graph of the derivative of a continuous function  is shown below. The domain of  will be .

 a. (3 pts) On what intervals is  increasing? Decreasing? Put answers in boxes.

 is increasing on is decreasing on

 b. (3 pts) On what intervals is  concave upward? Concave downward? Put answers in boxes.

 is concave up on is concave down on

 c. (4 pts) Assuming that , sketch a graph of  consistent with the given graph of the derivative .

 This is not the graph of . Sketch the graph of  here for part c.



6. (15 pts) A farmer with 800 ft of fencing wants to enclose a rectangular area and then divide it into four pens with

 fencing parallel to one side of the rectangle. Use calculus to find the largest possible total area of the four pens.

 Justify that your answer yields the largest area, simplify your answer, and show the units of the answer.

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7.a.(13 pts) Ellen can swim at 2 and run at 10 . She is in a race from the southern tip of a small island

 located 1 mile from the nearest point A on a straight shoreline. The race ends at point C which is 4 miles from

 point A. To what point B should Ellen swim in order to reach point C in the least amount of time? Your answer will

 be the distance  between points A and B. You will justify your answer in part b. Show the units in the answer.

 island

 A  B C

b. (2 pts) Justify your answer to part a. Depending on your method, you may find one or both of the approximations

  or  useful.

8. a. (5 pts) Find the most general antiderivative of .

 b. (5 pts) A particle moves along a straight line with velocity function  and its initial

 displacement is . Find its position function .

9. (15 points, 3 pts each for parts a, b, c, d, e) Indicate whether each of the following statements is either true or false.

 If true, explain how you know. If it is false, explain how you know and provide a counterexample.

 (A counterexample is an example that shows the statement is false.)

a. If , then .

b. If , then  must have a local maximum at .

c. Let  be continuous on the closed interval [1,2]. Then, has an absolute maximum, which

 occurs at either, , or a point where .

d. Ifis continuous on the domain [3,17], and  for all  in (3,17), then achieves its minimum

 value at .

e. and  are both antiderivatives of . Hint: No need for a counterexample

 here in part e., but think carefully of the definition of the antiderivative. Explain.

 Math 150 Exam 3

 San Diego State University

 Wednesday, November 30, 2016

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| Problem |  Points | Points Possible |
| 1 |  | 10 |
| 2 |  | 5 |
| 3 |  | 10 |
| 4 |  | 10 |
| 5 |  | 10 |
| 6 |  | 15 |
| 7 |  | 15 |
| 8 |  | 10 |
| 9 |  | 15 |
| Total |  | 100 |

 Name:\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

 TA Name: \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ Section:\_\_\_\_\_\_\_\_

 **Show** **All** of your work. No work shown = 0 points!

 **Box** **All** of your answers, We will not hunt for them.

 **READ** the directions, and make sure you answer the question that is asked.

 **Please** sign below:

 I, the undersigned, hereby pledge that all work on this examination is my own. I have

 neither given assistance to any other student, nor received assistance from any other

 student. I understand that cheating on this examination will result in a failure as well

 as being reported to San Diego State University’s Division of Academic Affairs.

 Signature:\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_