

Student: \_\_\_\_\_  
Date: \_\_\_\_\_  
Time: \_\_\_\_\_

Instructor: Dan Yasaki  
Course: MAT 120 (Summer 2013)  
Book: Barnett: Calculus for Business,  
Economics, Life/Social Sciences, 12e

Assignment: 4.4 & 5.1 Homework

1. Find  $f[g(x)]$ .

$$f(u) = u^2; g(x) = 6x^9 + 7$$

$$f[g(x)] = \square$$

2. Write the composite function in the form  $y = f(u)$  and  $u = g(x)$ .

$$y = e^{7-8x-3x^2}$$

Choose the correct answer below.

- A.  $y = e^u, u = 7 - 8x - 3x^2$   
 B.  $y = e^x + 7, u = -8x - 3x^2$   
 C.  $y = -8u - 3u^2, u = e^x + 7$   
 D.  $y = 7 - 8u - 3u^2, u = e^x$

3. Replace ? with an expression that will make the equation valid.

$$\frac{d}{dx} e^{x^7+2} = e^{x^7+2} \underline{\quad ? \quad}$$

The missing expression is  $\square$ .

4. Find  $f'(x)$  and simplify.

$$f(x) = (4x^3 + 7)^6$$

$$f'(x) = \square \text{ (Simplify your answer.)}$$

5. Find  $f'(x)$  and simplify.

$$f(x) = 5e^{-4x}$$

$$f'(x) = \square \text{ (Simplify your answer.)}$$

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6. Find  $f'(x)$  and simplify.

$$f(x) = 6 \ln(5 + x^2)$$

$$f'(x) = \square$$

7. Find  $f'(x)$  and simplify.

$$f(x) = (2 + \ln x)^4$$

$$f'(x) = \square \text{ (Simplify your answer.)}$$

8. Find  $f'(x)$  and find the equation of the line tangent to the graph of  $f$  at the indicated value of  $x$ . Find the value(s) of  $x$  where the tangent line is horizontal.

$$f(x) = (6x - 8)^{1/2}, \quad x = 4$$

$$f'(x) = \square$$

The equation of the line tangent to the graph of  $f$  at  $x = 4$  is  $y = \square$ .  
(Use integers or fractions for any numbers in the expression.)

Select the correct choice below and fill in any answer boxes in your choice.

A. The value(s) of  $x$  where the tangent line is horizontal is  $\square$ .  
(Use a comma to separate answers as needed.)

B. The tangent line is never horizontal.

9. Find the derivative.

$$\frac{dy}{dx} \text{ if } y(x) = \sqrt{x^2 + 6}$$

$$\frac{dy}{dx} = \square$$

10. Find  $g'(x)$  if  $g(x) = 6x e^{7x}$ .

$$g'(x) = \square$$

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11. Find the derivative and simplify.

$$\frac{d}{dx} \frac{\ln(2+x)}{x^7}$$

Choose the correct answer below.

- A.  $\frac{7(2+x) \ln(2+x) - x}{x^8(2+x)}$
- B.  $\frac{1 - 14x^6(2+x) \ln(2+x)}{2x^7(2+x)}$
- C.  $\frac{x - 7(2+x) \ln(2+x)}{x^8(2+x)}$
- D.  $\frac{14x^6(2+x) \ln(2+x) - 1}{2x^7(2+x)}$

12. Find  $y'$  if  $y = \ln(x^4 + 1)^{3/2}$ .

$$y' = \square$$

13. Find  $f'(x)$  and find the equation of the line tangent to the graph of  $f$  at the indicated value of  $x$ .

$$f(x) = \frac{x}{(2x-1)^9}, \quad x = 1$$

$$f'(x) = \square$$

The equation of the line tangent to the graph of  $f$  at  $x = 1$  is  $y = \square$ .  
(Type your answer in slope-intercept form.)

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14. Find  $f'(x)$  and find the value(s) of  $x$  where the tangent line is horizontal.

$$f(x) = \frac{x}{(4x-5)^4}$$

$$f'(x) = \square$$

Select the correct choice below and fill in any answer boxes in your choice.

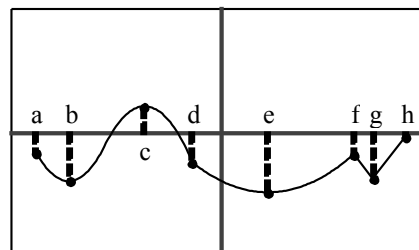
- A. The value(s) of  $x$  where the tangent line is horizontal is  $\square$ .  
(Use a comma to separate answers as needed.)
- B. The tangent line is never horizontal.

15. Find the derivative.

$$\frac{d}{dx}[5x(x^6+1)^8]$$

$$\frac{d}{dx}[5x(x^6+1)^8] = \square$$

16. The graph of  $y = f(x)$  is shown to the right. Identify the intervals on which  $f'(x) < 0$ .



Which of the following shows every interval on which  $f'(x) < 0$ ? Choose the correct answer below.

- A. (b,d), (f,g)
- B. (a,b), (c,e)
- C. (a,b), (c,d), (f,g)
- D. (a,b), (c,e), (f,g)

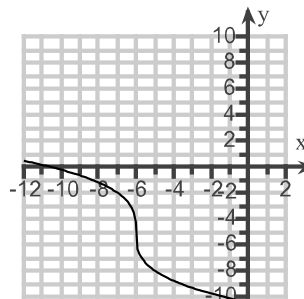
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17.

Match the graph of  $f$  with the correct sign chart.



Now, use all of the gathered information to choose the correct sign chart below.

A.  $f'(x)$  + + + ND + + +  
 \_\_\_\_\_  
 -6

B.  $f'(x)$  + + + 0 + + +  
 \_\_\_\_\_  
 -6

C.  $f'(x)$  - - - ND - - -  
 \_\_\_\_\_  
 -6

D.  $f'(x)$  - - - 0 - - -  
 \_\_\_\_\_  
 -6

18.

Find the critical values for the function below.

$$f(x) = 8x^3 - 6x^2 - 72x + 2$$

Find the critical values for  $f(x) = 8x^3 - 6x^2 - 72x + 2$ . Select the correct choice below and fill in any answer boxes within your choice.

A. The critical value(s) is/are .  
 (Use a comma to separate answers as needed.)

B. There are no critical values.

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19. For the function below, find (A)  $f'(x)$ , (B) the critical values of  $f$ , and (C) the partition numbers for  $f'$ .

$$f(x) = (x + 3)^{4/5}$$

(A)  $f'(x) = \square$

(B) Find the critical values of  $f$ . Select the correct choice below and, if necessary, fill in the answer box to complete your choice.

- A. The critical value(s) is/are  $x = \square$ . (Use a comma to separate answers as needed.)  
 B. There are no critical numbers.

(C) Find the partition values for  $f'$ . Select the correct choice below and, if necessary, fill in the answer box to complete your choice.

- A. The partition value(s) is/are  $x = \square$ . (Use a comma to separate answers as needed.)  
 B. There are no partition numbers.

20. For the function below, find (A)  $f'(x)$ , (B) the critical values of  $f$ , and (C) the partition numbers for  $f'$ .

$$f(x) = \frac{5}{x + 1}$$

(A)  $f'(x) = \square$  (Type your answer in factored form.)

(B) Find the critical values of  $f$ . Select the correct choice below and, if necessary, fill in the answer box to complete your choice.

- A. The critical value(s) is/are  $x = \square$ . (Use a comma to separate answers as needed.)  
 B. There are no critical numbers.

(C) Find the partition values for  $f'$ . Select the correct choice below and, if necessary, fill in the answer box to complete your choice.

- A. The partition value(s) is/are  $x = \square$ . (Use a comma to separate answers as needed.)  
 B. There are no partition numbers.

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21. Find the intervals on which  $f(x)$  is increasing, the intervals on which  $f(x)$  is decreasing, and the local extrema.

$$f(x) = 2x^3 - 3x^2 - 336x$$

Select the correct choice below and, if necessary, fill in the answer box to complete your choice.

- A. The function is increasing on .  
(Type your answer using interval notation. Use a comma to separate answers as needed.)
- B. There is no solution.

Select the correct choice below and, if necessary, fill in the answer box to complete your choice.

- A. The function is decreasing on .  
(Type your answer using interval notation. Use a comma to separate answers as needed.)
- B. There is no solution.

Which statement regarding the local extrema of the function is true? Choose the correct answer below.

- A. The function has a local minimum at  $x = -7$  and a local maximum at  $x = 8$ .
- B. The function has a local maximum at  $x = -7$  and a local minimum at  $x = 8$ .
- C. The function has no local extrema.

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22. Find the intervals on which  $f(x)$  is increasing, the intervals on which  $f(x)$  is decreasing, and the local extrema.

$$f(x) = 5x^4 - 140x^3 + 11$$

Select the correct choice below and, if necessary, fill in the answer box to complete your choice.

- A. The function is increasing on .  
(Type your answer using interval notation. Use a comma to separate answers as needed.)
- B. There is no solution.

Select the correct choice below and, if necessary, fill in the answer box to complete your choice.

- A. The function is decreasing on .  
(Type your answer using interval notation. Use a comma to separate answers as needed.)
- B. There is no solution.

Which statement regarding the local extrema of the function is true? Choose the correct answer below.

- A. The function has a local minimum at  $x = 21$ .
- B. The function has a local maximum at  $x = 0$ .
- C. The function has a local maximum at  $x = 0$  and a local minimum at  $x = 21$ .
- D. The function has a local minimum at  $x = 0$ .



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23. Find the intervals on which  $f(x)$  is increasing and the intervals on which  $f(x)$  is decreasing. Then sketch the graph. Add horizontal tangent lines.

$$f(x) = 2 - 27x + 9x^2 - x^3$$

Select the correct choice below and, if necessary, fill in the answer box to complete your choice.

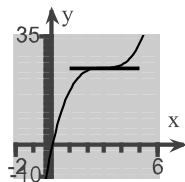
- A. The function is increasing on .  
(Type your answer using interval notation. Use a comma to separate answers as needed.)
- B. There is no solution.

Select the correct choice below and, if necessary, fill in the answer box to complete your choice.

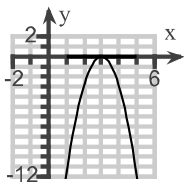
- A. The function is decreasing on .  
(Type your answer using interval notation. Use a comma to separate answers as needed.)
- B. There is no solution.

Choose the correct graph of  $f(x) = 2 - 27x + 9x^2 - x^3$  with the correct horizontal tangent line below.

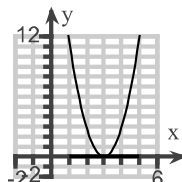
A.



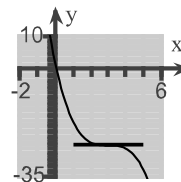
B.



C.



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24. Find the intervals on which  $f(x)$  is increasing and the intervals on which  $f(x)$  is decreasing. Then sketch the graph. Add horizontal tangent lines.

$$f(x) = x^4 - 32x^2$$

Select the correct choice below and, if necessary, fill in the answer box to complete your choice.

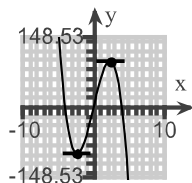
- A. The function is increasing on .  
(Type your answer using interval notation. Use a comma to separate answers as needed.)
- B. There is no solution.

Select the correct choice below and, if necessary, fill in the answer box to complete your choice.

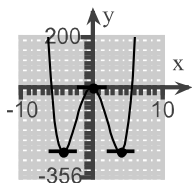
- A. The function is decreasing on .  
(Type your answer using interval notation. Use a comma to separate answers as needed.)
- B. There is no solution.

Choose the correct graph of  $f(x) = x^4 - 32x^2$  with the correct horizontal tangent line below.

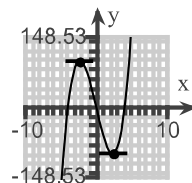
A.



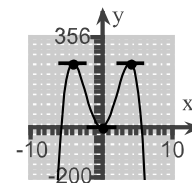
B.



C.



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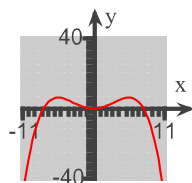
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25.  $f(x)$  is continuous on  $(-\infty, \infty)$ . Use the given information to sketch the graph of  $f$ .

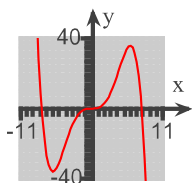
$f(-6) = 36, f(0) = 0, f(6) = -36;$	$f'(-6) = 0, f'(0) = 0, f'(6) = 0;$
$f'(x) > 0$ on $(-\infty, -6)$ and $(6, \infty);$	$f'(x) < 0$ on $(-6, 0)$ and $(0, 6)$

Choose the correct graph of  $f$  below.

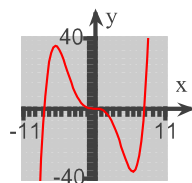
A.



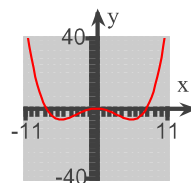
B.



C.



D.



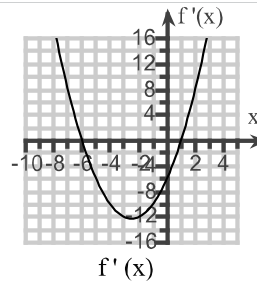
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26.

Use the given graph of  $f'(x)$  to find the intervals on which  $f(x)$  is increasing, the intervals on which  $f(x)$  is decreasing, and the local extrema. Sketch a possible graph of  $y = f(x)$ .



Select the correct choice below and, if necessary, fill in the answer box to complete your choice.

- A. The function  $f(x)$  is decreasing on .  
 (Type your answer using interval notation. Use a comma to separate answers as needed.)
- B. There is no solution.

Select the correct choice below and, if necessary, fill in the answer box to complete your choice.

- A. The function  $f(x)$  is increasing on .  
 (Type your answer using interval notation. Use a comma to separate answers as needed.)
- B. There is no solution.

Regarding the local extrema of the function  $f(x)$ , which statement is true? Choose the correct answer below.

- A. The function has a local minimum at  $x = -6$  and a local maximum at  $x = 1$ .
- B. The function has a local maximum at  $x = -6$  and a local minimum at  $x = 1$ .
- C. The function has no local extrema.

Choose a correct possible graph of  $y = f(x)$  below.

- A.
- B.
- C.
- D.

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27. Find the critical values, the intervals on which  $f(x)$  is increasing, the intervals on which  $f(x)$  is decreasing, and the local extrema. Do not graph.

$$f(x) = \frac{x^2}{x-2}$$

Select the correct choice below and, if necessary, fill in the answer box to complete your choice.

- A. The critical value(s) of the function are  $x = \square$ .  
(Use a comma to separate answers as needed.)
- B. There is no solution.

Select the correct choice below and, if necessary, fill in the answer box to complete your choice.

- A. The function is increasing on  $\square$ .  
(Type your answer using interval notation. Use a comma to separate answers as needed.)
- B. There is no solution.

Select the correct choice below and, if necessary, fill in the answer box to complete your choice.

- A. The function is decreasing on  $\square$ .  
(Type your answer using interval notation. Use a comma to separate answers as needed.)
- B. There is no solution.

Which statement regarding the local extrema of the function is true? Choose the correct answer below.

- A. The function has a local minimum at  $x = 0$  and a local maximum at  $x = 4$ .
- B. The function has a local minimum at  $x = 4$  and a local maximum at  $x = 0$ .
- C. The function has no local extrema.

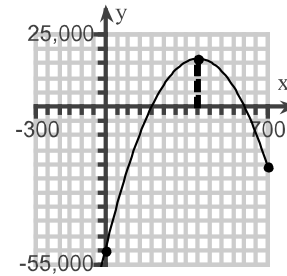
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28.

The graph of the total profit  $P(x)$  (in dollars) from the sale of  $x$  cordless electric screwdrivers is shown to the right.



(A) Write a brief verbal description of the graph of the marginal profit function  $y = P'(x)$ , including a discussion of any  $x$  intercepts.

(B) Sketch a possible graph of  $y = P'(x)$ .

(A) On what interval(s) is the marginal profit function  $P'(x)$  positive? Select the correct choice below and, if necessary, fill in the answer box to complete your choice.

A.

(Type your answer using interval notation. Use a comma to separate answers as needed.)

B. There is no solution.

On what interval(s) is the marginal profit function  $P'(x)$  negative? Select the correct choice below and, if necessary, fill in the answer box to complete your choice.

A.

(Type your answer using interval notation. Use a comma to separate answers as needed.)

B. There is no solution.

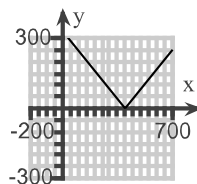
At what point(s) is the marginal profit function  $P'(x)$  equal to 0? Select the correct choice below and, if necessary, fill in the answer box to complete your choice.

A.  $x =$   (Use a comma to separate answers as needed.)

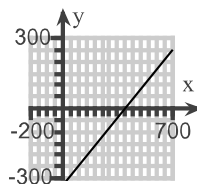
B. There is no solution.

(B) Sketch a possible graph of  $y = P'(x)$ . Choose the correct graph below.

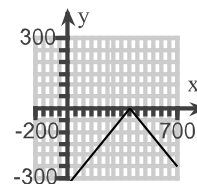
A.



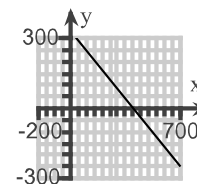
B.



C.



D.



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29. A manufacturer incurs the following costs in producing  $x$  water ski vests in one day, for  $0 < x < 150$ : fixed costs, \$180; unit production cost, \$25 per vest; equipment maintenance and repairs,  $0.05x^2$  dollars. So, the cost of manufacturing  $x$  vests in one given day is given by  $C(x) = 0.05x^2 + 25x + 180$ , where  $0 < x < 150$ .

- (A) What is the average cost  $\bar{C}(x)$  per vest if  $x$  vests are produced in one day?  
(B) Find the critical values of  $\bar{C}(x)$ , the intervals on which the average cost per vest is decreasing, the intervals on which the average cost per vest is increasing, and the local extrema. Do not graph.

(A)  $\bar{C}(x) = \square$

(B) Find the critical values of  $\bar{C}(x)$ . Select the correct choice below and, if necessary, fill in the answer box to complete your choice.

- A. The critical value(s) is/are  $x = \square$ . (Use a comma to separate answers as needed.)  
 B. There are no critical values of  $\bar{C}(x)$ .

The average cost per vest is decreasing on the interval(s)  $\square$ .

(Type your answer in interval notation. Use a comma to separate answers as needed.)

The average cost per vest is increasing on the interval(s)  $\square$ .

(Type your answer in interval notation. Use a comma to separate answers as needed.)

Find the local extrema. Select the correct choice below and, if necessary, fill in the answer boxes to complete your choice.

(Simplify your answer.)

- A.  $\bar{C}(\square) = \square$  is a local minimum. There is no local maximum.  
 B.  $\bar{C}(\square) = \square$  is a local maximum. There is no local minimum.  
 C.  $\bar{C}(\square) = \square$  is a local minimum and  $\bar{C}(\square) = \square$  is a local maximum.  
 D. There are no local extrema.

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Economics, Life/Social Sciences, 12e

**Assignment:** 4.4 & 5.1 Homework

1.  $(6x^9 + 7)^2$

2. A

3.  $7x^6$

4.  $72x^2(4x^3 + 7)^5$

5.  $-20e^{-4x}$

6.  $\frac{12x}{x^2 + 5}$

7.  $\frac{4(2 + \ln x)^3}{x}$

8.  $\frac{3}{(6x - 8)^{1/2}}$   
 $\frac{3}{4}x + 1$   
B

9.  $\frac{x}{\sqrt{x^2 + 6}}$

10.  $6e^{7x}(1 + 7x)$

11. C

12.  $\frac{6x^3}{x^4 + 1}$



Student: \_\_\_\_\_  
Date: \_\_\_\_\_  
Time: \_\_\_\_\_

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13. 
$$-\frac{16x+1}{(2x-1)^{10}}$$
$$-17x+18$$

14. 
$$-\frac{12x+5}{(4x-5)^5}$$
  
A,  $-\frac{5}{12}$

15.  $5(x^6+1)^7(49x^6+1)$

16. D

17. C

18. A,  $-\frac{3}{2}, 2$

19. 
$$\frac{4}{5(x+3)^{1/5}}$$
  
A,  $-3$   
A,  $-3$

20. 
$$-\frac{5}{(x+1)^2}$$
  
B  
A,  $-1$

21. A,  $(-\infty, -7), (8, \infty)$   
A,  $(-7, 8)$   
B

22. A,  $(21, \infty)$   
A,  $(-\infty, 21)$   
A

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23. B  
A,  $(-\infty, \infty)$   
D

24. A,  $(-4, 0), (4, \infty)$   
A,  $(-\infty, -4), (0, 4)$   
B

25. C

26. A,  $(-6, 1)$   
A,  $(-\infty, -6), (1, \infty)$   
B  
C

27. A, 0, 4  
A,  $(-\infty, 0), (4, \infty)$   
A,  $(0, 2), (2, 4)$   
B

28. A, (0, 400)  
A, (400, 700)  
A, 400  
D

29.  $0.05x + 25 + \frac{180}{x}$   
A, 60  
(0, 60)  
(60, 150)  
A, 60, 31