Math 122: Test 3

Signature _____

Printed Name _____

Student ID _____

Instructions: Sign and print your name and write your student ID number in the spaces provided above. Read each question below and decide which choice (a, b, c, or d) best answers the question. Circle the letter corresponding to your choice of the best answer. Each problem is worth 7 points. If you choose the correct answer, you will receive 7 points for the problem. If you choose an incorrect answer, you will receive 0 points for the problem. If you leave a problem blank (that is, if you do not circle a letter), then you will receive 7/4 points for the problem. It is up to you to make sure that your choice for an answer or lack thereof is clear. If I have to guess at what you mean (for example, if you circle or leave marks around two letters in the same problem), then you will be given 0 points for the problem.

Caution: Your eyes should stay on your own work. Please take note that the correct answers on the tests near you may differ from your own test paper regardless of the color of the tests.

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1. What is the derivative of $\dfrac{1}{\sqrt{x}}$?

   (a) $-\dfrac{1}{2}x^{-3/2}$ (b) $\dfrac{1}{2}x^{1/2}$ (c) $2\sqrt{x}$ (d) $-2x^{-1/2}$

2. What is the derivative of xe^{-x} ?

   (a) $e^{-x}+xe^{-x}$ (b) $xe^{-x}+e^{-x-1}$ (c) $e^{-x}-xe^{-x-1}$ (d) $e^{-x}-xe^{-x}$

3. What is the derivative of $\ln(x^3-3x)$?

   (a) $\dfrac{1}{x^3-3x}$ (b) $\dfrac{1}{(x^3-3x)^2}$ (c) $\dfrac{3x^2-3}{x^3-3x}$ (d) $\dfrac{3x^2-3}{(x^3-3x)^2}$

4. What is the derivative of $\dfrac{x}{2x-1}$?

   (a) $\dfrac{1}{(2x-1)^2}$ (b) $\dfrac{-1}{(2x-1)^2}$ (c) $\dfrac{1}{2}$ (d) $\dfrac{1}{4}$

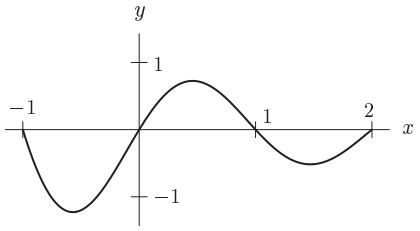


Figure 1

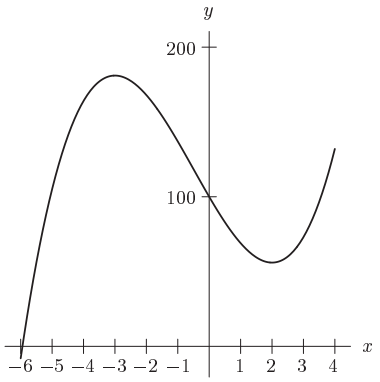


Figure 2

5. How many critical points are in the graph pictured in Figure 1?

   (a) 1 (b) 2 (c) 3 (d) 4

6. Which of the following approximates a local minimum *value* for the function graphed in Figure 2?

   (a) -6 (b) 2 (c) 4 (d) 60

7. Suppose that

$$g(x) = (4x^3 - 6x^2 + 6x - 3)e^{2x} \qquad \text{and} \qquad g'(x) = 8x^3e^{2x}.$$

   You do not need to justify that the derivative of $g(x)$ above is what I have written for $g'(x)$. What is the derivative of $g(x)^3$?

   (a) $24x^3(4x^3 - 6x^2 + 6x - 3)^2e^{2x}$ (b) $24x^3(4x^3 - 6x^2 + 6x - 3)^2e^{4x}$

   (c) $24x^3(4x^3 - 6x^2 + 6x - 3)^2e^{6x}$ (d) $24x^3(4x^3 - 6x^2 + 6x - 3)^2e^{8x}$

8. The population in Mexico in millions is approximated by the formula $P(t) = 70e^{0.03t}$, where t is the number of years after 1980. In the year 2000, approximately how fast will the population of Mexico be increasing?

   (a) $70e^{0.6}$ million people per year (b) $27e^{0.6}$ million people per year

   (c) $6e^{0.6}$ million people per year (d) $2.1e^{0.6}$ million people per year

9. The slope of the tangent line to the graph of $y = 2(ax - 1)^5$ at $x = 0$ is 4. What is the value of a?

   (a) 2/5 (b) 1/5 (c) $-1/10$ (d) $-1/5$

10. The cost of producing a quantity, q, of a product is given by

$$C(q) = 1000 + 30e^{0.02q} \quad \text{dollars.}$$

    Which of following is an estimate for the marginal cost (in dollars per item) when $q = 20$? The choices are based on one or more of the estimates given in the table to the right.

    (a) 0.612 (b) 0.9

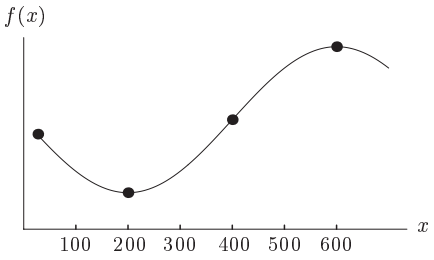
    (c) 6.12 (d) 45

Approximate Values
$e^{0.01} \approx 1.01$
$e^{0.02} \approx 1.02$
$e^{0.04} \approx 1.04$
$e^{0.06} \approx 1.06$
$e^{0.1} \approx 1.1$
$e^{0.2} \approx 1.2$
$e^{0.4} \approx 1.5$
$e^{0.6} \approx 1.8$

11. At what x does the function $x^3 - 3x$ have a local maximum value?

(a) 0 and 3 (b) 0 only (c) -1 and 1 (d) -1 only

12. For the graph pictured in to the right, at which value of x below is there an inflection point?



(a) 10 (b) 200 (c) 400 (d) 600

13. Which of the following is true about the functions $f(x) = (x-1)^5$ and $g(x) = (x-1)^6$?

(a) The function $f(x)$ has an inflection point at $x = 1$, but the function $g(x)$ does not.

(b) The function $g(x)$ has an inflection point at $x = 1$, but the function $f(x)$ does not.

(c) Both $f(x)$ and $g(x)$ have an inflection point at $x = 1$.

(d) Neither $f(x)$ nor $g(x)$ haa an inflection point at $x = 1$.

14. A function $f(x)$ has a continuous derivative $f'(x)$ with values indicated in the table below. If $f(x)$ has a local maximum value at $x = A$ and for no other value of x, then which of the following is true?

x	0	1	2	3	4	5	6	7	8	9	10
$f'(x)$	1.5	0.8	0.2	-0.6	-1.2	-2.1	-1.5	-0.7	0.5	1.1	1.8

(a) $0 \le A \le 1$ (b) $2 \le A \le 3$ (c) $4 \le A \le 6$ (d) $7 \le A \le 8$