

Test 2 - MTH 1310

Dr. Graham-Squire, Summer 2012

Name: _____

ID Number: _____

I pledge that I have neither given nor received any unauthorized assistance on this exam.

(signature)

DIRECTIONS

1. Show all of your work and use correct notation. A correct answer with insufficient work or incorrect notation will lose points.
2. Clearly indicate your answer by putting a box around it.
3. Cell phones and computers are not allowed on this test. Calculators are allowed on the first part of the test, however you should still show all of your work. Calculators are not allowed on the second part of the test.
4. Give all answers in exact form, not decimal form (that is, put π instead of 3.1415, $\sqrt{2}$ instead of 1.414, etc) unless otherwise stated.
5. If you need to use the quadratic formula, it is $\frac{-b \pm \sqrt{b^2 - 4ac}}{2a}$.
6. Make sure you sign the pledge and write your ID on both pages.
7. Number of questions = 8. Total Points = 70.

Calculator Allowed

1. (7 points) You are given that $m(x) = \frac{-x^2}{5(x^2 + 10)}$, $m'(x) = \frac{-4x}{(x^2 + 10)^2}$,
 $m''(x) = \frac{12(x^2 - 4)}{(x^2 + 10)^3}$. Use calculus to answer the following questions:

(a) Does the graph of m have a local maximum or minimum? If so, what are its coordinates? State whether it is a maximum or a minimum.

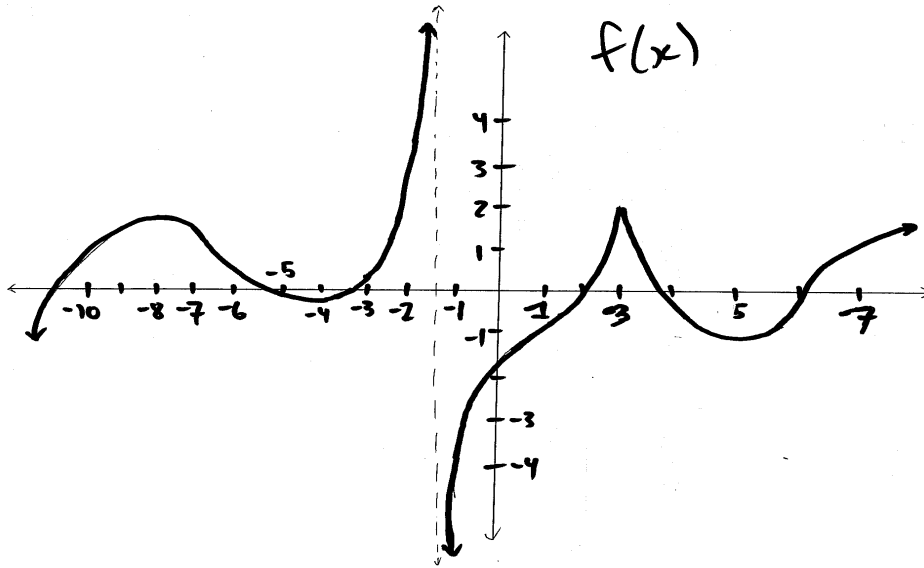
(b) On what interval(s) is m increasing?

2. (9 points) You are given that $m(x) = \frac{-x^2}{5(x^2 + 10)}$, $m'(x) = \frac{-4x}{(x^2 + 10)^2}$,
 $m''(x) = \frac{12(x^2 - 4)}{(x^2 + 10)^3}$. Use calculus to answer the following questions:
- (a) On what interval(s) (if any) is the graph of m concave downward?

(b) On what interval(s) (if any) is the graph of m concave upward?

(c) Find the (x, y) -coordinates of each point of inflection for m . Answers *must* be written as ordered pairs.

3. (8 points) Let $f(x)$ be represented by the following graph:



(a) On what interval(s) is $f(x)$ increasing? Decreasing?

(b) On what interval(s) is $f(x)$ concave downward?

(c) Find the (x, y) -coordinates of all local maximums and minimums.

(d) Find the (x, y) -coordinates of all inflection points.

(e) At what x -values in the domain of f does $f'(x)$ not exist?

4. (12 points) The daily cost of producing x portable DVD players is approximated by the function

$$C(x) = 0.0001x^3 - 0.08x^2 + 40x + 5000.$$

- (a) Find the marginal cost function.
- (b) Find the marginal cost when $x = 200$. What meaning does it have?
- (c) Find the marginal cost at $x = 300$ and $x = 400$. What does this tell you about how many DVD players you should produce?
- (d) Find the average cost function $\bar{C}(x) = \frac{C(x)}{x}$, then calculate $\bar{C}'(x)$.
- (e) Calculate $\bar{C}'(200)$. Does its value make sense with the previous information?

5. (8 points) The supply equation for radios is given by

$$f(x) = 0.3\sqrt{x} + 10$$

where x is the quantity supplied and f is the unit price in dollars. Use differentials to approximate the change in price when the quantity supplied increases from 10,000 to 10,500 units.

No calculators on this part

6. (8 points) Find $f'(x)$ if

$$f(x) = \frac{(3x + 2)^4}{x^2 + 1}$$

You do not need to simplify your answer.

7. (12 points) Find the second derivative of the function $f(x) = (x^3 - 7)^8$. Simplify your answer by factoring the final expression.

8. (6 points) Find $f'(x)$ if

$$f(x) = (4x^5 + 7)(x^2 + 7x + 10)$$

Simplify your answer.

Extra Credit(2 points) In what order would you apply the product, quotient, and/or chain rules for the derivative of the function

$$f(x) = \left[(2x + 7) \left(\frac{(x^3 - 4)^3}{5x} \right) \right]^8$$

You do not need to actually calculate the derivative.