Midterm 2 – Math 203

Friday, October 19, 2018

You may use standard 8.5in by 11in double sided cheat sheet.
You may use a simple (non-graphing) calculator.
Justify your answers to obtain full credit (and partial credit, too).
You have 50 minutes.
This exam consists of 6 questions and a bonus problem.
Please verify that you have all pages.

Name:_____ **ID#:**_____

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1. (*25 points*) Differentiate the following functions. You do not need to simplify your answers.

(a) $y = (3x^2 + 5)^2(x + 1)^6$

(b) $y = \sqrt{x^2 + 1}$

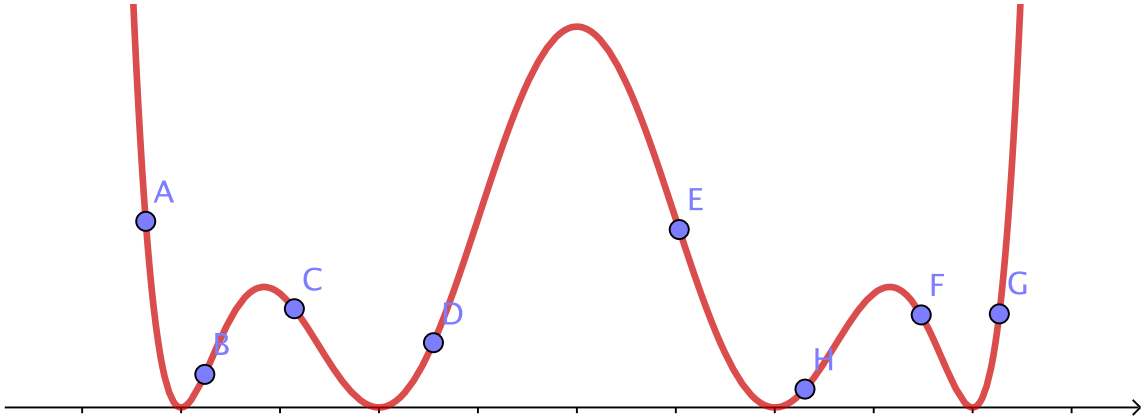
(c) $y = \dfrac{x + 1}{x^2 + 2}$

(d) $y = (x + 1)(2x - 3)$

(e) $y = \dfrac{x^2 + x + 2}{(1 + x^4)^2}$

2. (*15 points*) Find an equation of the line tangent to $x^2 + xy + y^2 = 3$ at $(1, 1)$

3. (*10 points*) Below is the graph of a **function** $f(x)$. Answer the questions about the function to your best ability. No justification necessary.



(a) Which points on the graph are places where $f'(x) > 0$?

(b) Which points represent places where $f'(x) > 0$ and $f''(x) > 0$?

(c) Which points on the graph are places where $f'(x) < 0$?

(d) Which points represent places where $f'(x) < 0$, and $f''(x) > 0$?

(e) Which points on the graph are inflection points for $f(x)$?

4. (*20 points*) Your clothing store sells a total of 40 suits each year. Storing the suits costs \$8 per suit (based on the average number of suits). To make a new order of suits costs \$10 per order. Let x represent the number of suits in each order and r represent the number of orders.

(a) Find a function for the total inventory cost (carrying cost + ordering costs) associated with ordering and storing the suits.

(b) Find the amount of suits per order you should make to minimize the inventory cost. How many orders per year is that?

5. (*20 points*) Let $f(x) = x^3 + 3x^2$

(a) Find the (open) intervals where f is increasing and where f is decreasing.

(b) Find all relative extrema (both x and y coordinates). Indicate whether it is a relative maximum or relative minimum.

(c) Find the (open) intervals where f is concave up and where f is concave down

(d) Find all inflection point(s) (both x and y coordinates)

6. (*10 points*) A spherical snowball is placed in the sun. The sun melts the snowball so that its radius **decreases** 1/4 inches per hour. Find the rate of change of the volume with respect to time at the instant the radius is 4 inches The volume of a sphere is $V = \frac{4}{3}\pi r^3$.

7. (*10 points*) (Bonus) Suppose you want to find the optimal ticket price for a show. From past data, a basic ticket price of \$20 will attract 400 attendees. When you increase the price to \$25, the number of attendees drops to 350. Assuming the demand equation is linear, find a demand equation relating the ticket price p to the number of attendees x. Use this to find the equation for revenue.

Final Score

	Score	Out of
Question 1		25
Question 2		15
Question 3		10
Question 4		20
Question 5		20
Question 6		10
Bonus		10
Total		110