

Midterm 2 – Math 203

Tuesday, April 2, 2019

This is a closed-book exam.

You are allowed one cheat sheet (8.5 inch by 11 inch 2-sided)

Non-graphing calculators allowed.

Justify your answers to obtain full credit (and partial credit, too).

You have 75 minutes.

This exam consists of 7 questions.

Please verify that you have all pages.

Name: _____

ID#: _____

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1. (*15 points*) You sell a total of 20 crates of ice cream each month. Storing the ice cream \$8 per crate (based on the average number of crates). To make a new order of crates costs \$5 per order. Let x represent the number of ice cream crates 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 crates of ice cream.
- (b) Find the amount of crates per order you should make to minimize the inventory cost. How many orders per month is that?

2. (*10 points*) A spherical snowball is placed in the sun. The sun melts the snowball so that its volume **decreases** 16π 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 $V = \frac{4}{3}\pi r^3$.

3. (20 points) Evaluate the following integrals. (**Don't forget $+C$ when necessary!**)

(a) $\int (e^{17x} + x^{3/4}) dx$

(b) $\int_1^e (9x^2 + x^{-1}) dx$ (Recall: $\ln(e) = 1$ and $\ln 1 = 0$.)

(c) $\int_1^{16} \frac{1}{\sqrt{x}} dx$

(d) $\int \left(7x + 4x^3 + \frac{1}{x^3} \right) dx$

4. (20 points) Find $\frac{dy}{dx}$ for the following functions. **You do not have to simplify your answer.**

(a) $y = \ln(4x^2 + 5x)$

(b) $y = 2x^3e^x$

(c) $y = e^{4x^4+7x^2+4}$

(d) $y = \frac{\ln x}{4e^x + x^2}$

5. (10 points) Use logarithmic differentiation to find the derivative of $y = \frac{(x+1)^5(2x^3+5)^3}{\sqrt{2x+4}}$.
You do not need to simplify your answer.

6. (15 points) An ecologist is conducting a research project on breeding pheasants in captivity. She first must construct suitable pens. She wants a rectangular area with two additional fences across its width, as shown in the sketch. Find the **dimensions** of the pen that has the maximum area she can enclose with 2400 m of fencing.



- 7.** (10 points) Find an equation of the line tangent to $x^2y + y^4 = 4 + 2x$ at $(-1, 1)$

Final Score

	Score	Out of
Question 1		15
Question 2		10
Question 3		20
Question 4		20
Question 5		10
Question 6		15
Question 7		10
Total		100