Math 1271-040 Midterm Exam 2

Name: ______________________________

ID: ______________________________

TA: ______________________________

Section: ______________________________

1. **Do not open the exam until instructed.**
2. There are 5 problems, each on a single page. Make sure no pages are missing.
3. You have 50 minutes.
4. Each problem is worth 6 points, equally distributed among its parts. As the problems are of varying difficulty level, if you are stuck, you may wish to skip ahead and do other parts first.
5. Organize your work clearly and show an appropriate amount of detail. Illegible scribbles or unsubstantiated correct answers will receive little or no credit.
6. You may (but do not need to) use a scientific calculator.
7. No books, notes, graphing calculators, mobile phones, computers, Rubik's cubes, or other devices allowed.

Problem 1 (6 points)	
Problem 2 (6 points)	
Problem 3 (6 points)	
Problem 4 (6 points)	
Problem 5 (6 points)	
$\sum$ (30 points total)	

Problem 1. Calculate y'.
Answers can be in terms of both x and y; it is not necessary to simplify answers.

(a) $2x^3 + x^2y - xy^3 = 2$.

(b) $y = \dfrac{e^{-x}\cos^2 x}{(x^2+x+1)^5\sqrt{x-1}}$

Problem 2. The volume of a cube is increasing at a rate of 10 cubic meters per minute. How fast is the surface area increasing when the length of an edge is 5 meters.

Problem 3. Evaluate the limits. Simplify answers but leave them exact (*e.g.*, do not use decimal approximations). Answers could be ∞, $-\infty$, or "does not exist."

(a) $\lim_{x\to\infty} x^{3/x}$

(b) $\lim_{x\to 0^+} \dfrac{\ln(1-x) - \sin x}{1-\cos^2(x)}$

(c) $\lim_{x\to 0} \dfrac{x\sin(x)\sin(2x)\sin(3x)}{x^3\sin(5x)}$

Problem 4. A right circular cylinder is inscribed in a right circular cone with height h and base radius r. Find the largest possible volume of such a cylinder.

Problem 5. Estimate $\sqrt[4]{10008}$ in the following ways.
It is **not** necessary to simplify expressons (*e.g.*, sums, fractions) involving only numbers.

(a) Use a linear approximation (or differentials) to estimate.

(b) Use Newton's Method to estimate: pick a sensible x_1 and calculate x_2.