Calculus I (UN1101) Practice Midterm #2

Instructor: Robin Zhang

Student Name (UNI): ______________________________

Instructions:

This exam contains **7 pages** (including this cover page) and **5 questions**. The total number of possible points is **35 points**. You will have **60 minutes** to complete this exam.

- **Print your name and UNI** in the space above.
- **Answer the questions in the space provided** on the question sheets. You may use extra paper.
- **Clearly identify and simplify your answers**. You will not receive full credit if there are multiple apparent answers, even if one of them is correct.
- **Write legibly and show your work**, you may receive partial credit for intermediate steps. For questions requiring explanations, correct answers without any reasoning or work may not receive full credit.
- **No calculators, computational devices, or consulting other people** during the duration of this exam. Any cheating will result in an automatic failing grade in the course and potential administrative action.
- **You may consult your notes and textbook** for this exam. This does not include WebAssign, Courseworks, or other online resources.
- **Upload your exam to Gradescope** at the end of the time allotted via PDF or images. At the end of the exam, you have 10 minutes to upload your exam. Any exams uploaded after the end of the upload period will not be accepted.

Do not write in the table to the right.

Question	Points	Score
1	11	
2	9	
3	5	
4	6	
5	4	
Total:	35	

1. Consider the function

$$f(x) = (3x-1)e^{3x}$$

on the interval $[-2, 2]$.

(a) (3 points) Find $f'(x)$ and $f''(x)$.

(b) (4 points) What are the local maxima, local minima, absolute maxima, and absolute minima of $f(x)$ in the interval $[-2, 2]$?
Hint: You can use that $0 < e^{-6} < \frac{1}{100}$

(c) (2 points) What does the Mean Value Theorem tell you about $f(x)$ on the interval $[-2, 2]$?
Hint: first determine if $f(x)$ even satisfies the conditions of the Mean Value Theorem!

(d) (2 points) Sketch a graph of the function on the interval $[-2, 2]$ with its endpoints, critical points, and local/absolute extrema.

2. Consider

$$y = \ln(x)^2 + e^{-x}$$
$$z = (x^2)^{\sin(x)}.$$

(a) (3 points) Find $\frac{dy}{dx}$.

(b) (3 points) Find $\frac{dz}{dx}$.

(c) (3 points) Use the linearization of y at $x = 1$ to approximate the value of y when $x = 2$.

3. Consider the curve given by the equation

$$3y^3 - 8x^7y = 4y$$

   (a) (3 points) Find $\frac{dy}{dx}$ in terms of x and y.

   (b) (2 points) Find the equation of the tangent line to the curve at $(1, 2)$.

4. Find the limit if it exists. If the limit does not exist, explain why.

   (a) (3 points)

$$\lim_{x\to 0^-} \frac{xe^x}{\tan(x)^2}$$

   (b) (3 points)

$$\lim_{x\to 0^+} \sqrt{x}\ln(x)$$

5. (4 points) A spherical tumor is growing in volume at a constant 2 cubic millimeters per month. How fast is the circumference of the tumor growing when the volume is 36 cubic millimeters?