Math 124C **Midterm 1** **Autumn 2024**

Your Name

Your Signature

Student ID #

- Turn off all cell phones, pagers, radios, mp3 players, and other similar devices.
- Please write your name at the top of every page.
- This exam is closed book. You may use one $8.5'' \times 11''$ sheet of handwritten notes (both sides OK). Do not share notes. No photocopied materials are allowed.
- You can use only a Texas Instruments TI-30X IIS calculator.
- In order to receive credit, you must **show all of your work**. If you do not indicate the way in which you solved a problem, you may get little or no credit for it, even if your answer is correct.
- Place a box around your answer to each question.
- The pages have problems on **both** sides.
- If you need more room, use the blank last page and indicate that you have done so.
- Raise your hand if you have a question.
- This exam has 5 pages, plus this cover sheet. Please make sure that your exam is complete.

Question	Points	Score
1	12	
2	7	
3	7	
4	8	
5	8	
6	8	
Total	50	

1. Determine if the following limits exist. If they exist, compute them. Justify your answers.

   (a) (4 points) $\lim_{x\to\infty} \sqrt[3]{\dfrac{1-x^2}{8x^2-5x}}$

   (b) (4 points) $\lim_{x\to 2} \dfrac{x-\sqrt{x+2}}{x-2}$

   (c) (4 points) $\lim_{x\to 2} \dfrac{2x^2-x-5}{x^3-4x^2+12}$

2. (7 points) Use the limit definition of the derivative on this problem. Do not use differentiation formaulas. Find the slope of the tangent line to the curve $y = \dfrac{1}{\sqrt{5x}}$ at the point $(5, 1/5)$.

3. (7 points) Calculate the equation of the tangent line to $f(t) = 3t^2 \cdot \cos(t)$ at $t = \pi$.

4. (8 points) Let c be a constant and $f(x) = \begin{cases} x^2 - 2x + c & \text{if } x \leq 2; \\ cx + 5 & \text{if } x > 2. \end{cases}$

   Find all values of c that make $f(x)$ a continuous function. If there are none, explain why. Use limits to give a careful justification of your answer.

5. (8 points) Find all the points (a, b) on the curve $y = \left(x^2 - 3\right) e^x$ where the tangent line is horizontal.

6. (8 points) Where does the tangent line to the curve $y = x^3 - 2x^2 + x$ at the point where $x = 0$ intersect the curve a second time? Give both coordinates of the point of intersection.

This page is for extra work.