Math 124B **Midterm 1** **Winter 2023**

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 $\boxed{\text{a box around your answer}}$ 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) $\lim_{t\to 1} \dfrac{2t^2+t-3}{t^2+4t-5}$

   (b) (4 points) $\lim_{t\to \infty} \cos\left(\dfrac{t+1}{1+3t-5t^2}\right)$

   (c) (4 points) $\lim_{x\to 3} \dfrac{\sqrt{2x-1}}{x^2-6x+9}$

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 $y = \sqrt{x+3}$ at the point $(1,2)$.

3. (7 points) Calculate the equation of the tangent line to $g(x) = (x+2)\,e^x$ at $x = 0$.

4. (8 points) Let c be a constant and $f(x) = \begin{cases} x^2+2 & \text{if } x < 1; \\ cx-5 & \text{if } x \geq 1. \end{cases}$

   Find the value of c that makes $f(x)$ a continuous function everywhere. Use limits to give a careful justification of your answer.

5. (8 points) A particle is travelling in a straight line. Its position is given by $x = t^3 - 6t^2 + 12t$, where x is in feet and t is in seconds. Find the acceleration when the velocity is 0.

6. (8 points) Where does the normal line to the parabola $y = x^2 - 3x + 4$ at the point $(1,2)$ intersect the parabola a second time? Give both coordinates of the point of intersection.

This page is for extra work.