Math 124B **Midterm 2** **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 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	13	
2	12	
3	8	
4	8	
5	9	
Total	50	

1. Compute the derivatives of the following functions. Do not simplify your answers.

   (a) (4 points) $f(x) = \sqrt{\cos^2 x + 5x^7}$

   (b) (4 points) $g(t) = \tan^{-1}\left(\dfrac{5t+3}{t^2+4}\right)$

   (c) (5 points) $y = x^{\sqrt{x}}$ (Give your answer in terms of x.)

2. Consider the curve given by the parametric equations

$$\begin{aligned} x &= t^2 - 6t \\ y &= t - 3\ln t \end{aligned}$$

(a) (6 points) Find the equation of the tangent line to the curve when $t = 1$.

(b) (6 points) Find all times $t \geq 0$ when the tangent line has slope equal to $\dfrac{1}{3}$.

3. (8 points) Each side of a square is increasing at a rate of 2 feet/second. At what rate is the area of the square increasing when the area of the square is 49 square feet?

4. (8 points) Find all the points (a,b) on the curve $x^2+y^3-6x=18$ where the tangent line is horizontal.

5. (9 points) Let $x^2 - 6xy + y^3 = 8$. Find the value of y'' at the point where $x = 0$.

This page is for extra work.