Math 124F **Midterm 1** **Autumn 2021**

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) $\lim_{x\to 2} \dfrac{x^2-4}{2x^2-3x-2}$

   (b) (4 points) $\lim_{h\to 0} \left(\dfrac{2}{h^3+2h} - \dfrac{1}{h}\right)$

   (c) (4 points) $\lim_{x\to\infty} \left(\sqrt{4x^2-3x} - 2x\right)$

2. (7 points) Use the limit definition of the derivative on this problem. Find the slope of the tangent line to the curve $y = \dfrac{1}{5-2x}$ at the point $(2,1)$.

3. (7 points) Calculate the equation of the tangent line to $g(x) = \dfrac{1+x}{1+x+x^2}$ at $x = 2$.

4. (8 points) Let $H(x) = \begin{cases} (x-1)^2 & \text{if } x < 0; \\ e^{x^2} & \text{if } x \geq 0. \end{cases}$

   Is $H(x)$ a continuous function? 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 $x = \left(t^2 - 7\right) e^t$, where x is in feet and t is in seconds. Find all times when the acceleration of the particle is zero.

6. (8 points) Find **two** different points on the curve $y = \dfrac{x}{x-1}$ at which the tangent line passes through the point $(-14, 2)$.

This page is for extra work.