

Math 124 C, Spring 2023 Midterm I

April 25, 2023

Name _____

Student Number _____

Instructions

- These exams will be scanned. **Please write your name and student number clearly.**
- There are 4 questions. The exam is out of 50 points.
- You are allowed to use one page of notes written only on one side of the sheet in your own handwriting. **Hand in your notes with your exam.**
- You can only use a Ti-30x IIS calculator. Unless otherwise stated, you have to give exact answers to questions. ($\frac{2\ln 3}{\pi}$ and $1/3$ are exact, 0.699 and 0.333 are approximations for those numbers.)
- Show your work. If we cannot read or follow your work, we cannot grade it. **You may not get full credit for a right answer if your answer is not justified by your work.**

1. (16 points) Differentiate the following functions. You do not have to simplify your answers, but make sure your use of parentheses is correct.

(a) $f(x) = 0.3x^2 - \frac{1}{2x^3} + e^{2x} + 3\sqrt{x} + \pi$

No negative exponents in your answer for this part.

(b) $g(x) = \frac{5 \sin(6x) + 7 \cos(8x)}{9e^x - x^{10}}$

(c) $h(x) = (3x^3 + 5) \tan(e^x)$

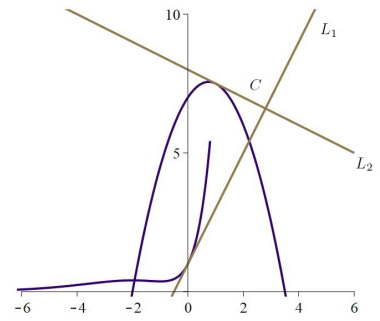
3. (12 points) Let L_1 be the tangent line to

$$y = e^x(x^2 + x + 1).$$

at the point where $x = 0$. Let L_2 be the tangent line to the parabola

$$y = -x^2 + \frac{3}{2}x + 7$$

at the point where $x = a$. The two lines intersect at point C at a right angle.



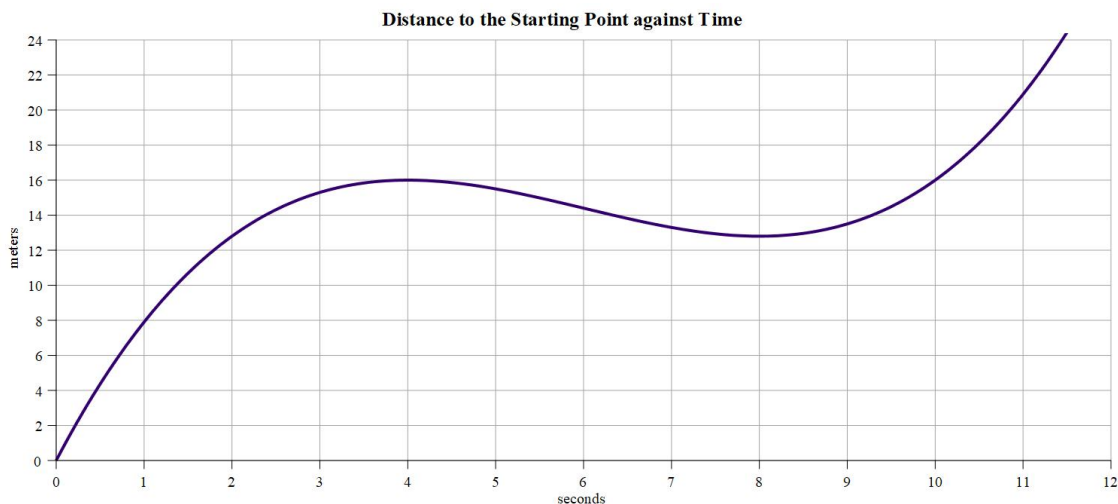
You cannot use the graph to guess your answers, but you can use it to see if your answers make sense.

(a) Find the equation of the tangent line L_1 .

(b) Find the value of a and the equation of the tangent line L_2 .

(c) Find the coordinates of point C .

4. (9 points) An object moves along a straight line. Its distance to its starting point $s(t)$ is given on the graph below. The distance s is measured in meters and time t in seconds.



Answer the following questions. *Some of your answers may be approximate and this will be taken into consideration while grading. Also, this is a no-partial credit question.*

- (a) Which one is more? Check one box.

The average velocity of the object on $[2, 4]$

The velocity of the object at $t = 2$

- (b) Estimate the velocity of the object at $t = 6$. *Round your answer to the nearest tenth.*

Answer:

- (c) At what times is the velocity of the object 0?

Answer:

- (d) In which interval is the object going towards its starting position?

Answer:

- (e) List

$$s'(4), s'(0.5), s'(8.9), s'(6)$$

in *increasing* order from the least to the greatest by placing them in the boxes below.

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