

Math 124 C Spring 2023 Midterm II

May 16, 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) Compute $\frac{dy}{dx}$ for the following.

(a) $y = \sqrt{1 + \sin^7(e^x)}$

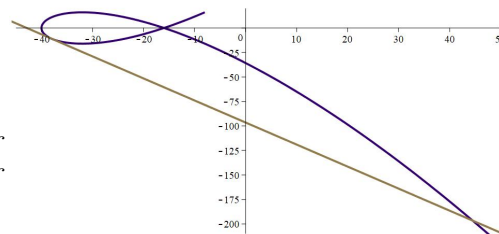
(b) $\tan(x + y) - 4x^3y^2 = e^{xy}$

(c) $y = (1 + x^2)^{5x}$

2. (11 points) A curve is given parametrically by

$$x = 2t^2 - 40 \qquad y = t^3 - 12t.$$

You can use the graph to see if your answers make sense, but your answers must be supported by your calculus and algebra work for credit.



(a) Find the equation of the tangent line to the curve at the point $(-38, -11)$.

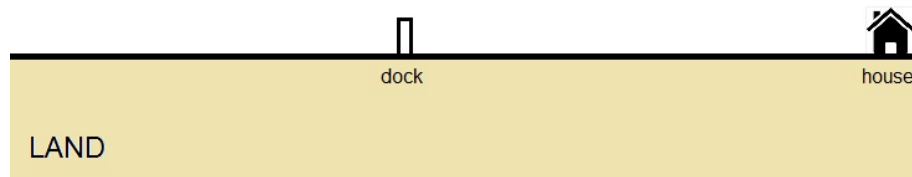
(b) The tangent line intersects the curve again at another point. Find the coordinates of that point.

3. (13 points) Use linear approximation near $x = 1$ to estimate a root b of the polynomial

$$p(x) = 4x^3 - x^2 + 3x - 7.$$

Is the approximate value of b you found more than or less than the actual value of b ? Explain.
A number b is a root of a polynomial $p(x)$ if $p(b) = 0$.

4. (10 points) There is a lighthouse on a small rocky island 2 kilometers from the dock. It has a rotating light. On a clear and sleepless night you observe that the light from the lighthouse sweeps your house at a rate of 4 meters per second moving towards the dock. If your beach house is 3 kilometers from the docks, how fast is the light of the lighthouse turning? Give your answer in radians per second and in revolutions per minute. Be careful with the units. The picture is not to scale.



This page is blank. If you continued a question here, make a note on the question page so we can have a look.