Math 124 H - Autumn 2022
Midterm Exam Number Two
November 15, 2022

Name: _____ Student ID no. : _____

Signature: _____

1	15	
2	12	
3	9	
4	9	
5	15	
Total	60	

This grid is purely decorative.
The exam is graded online.

- This exam consists of **FIVE** problems on **FOUR** double-sided pages. The fourth page is left blank for scratch work.
- Show all work for full credit.
- You may use a TI-30X IIS calculator during this exam. Other calculators and electronic devices are not permitted.
- Please evaluate trig functions at nice values on the unit circle when possible. You do not otherwise need to simplify your answers.
- If you use a trial-and-error or guess-and-check method when a more rigorous method is available, you will not receive full credit.
- Draw a box around your final answer to each problem.
- **Do not write within 1 centimeter of the edge!** Your exam will be scanned for grading.
- If you run out of room, write on one of the scratch work pages **and indicate that you have done so**. If you still need more room, raise your hand and ask for an extra page.
- You may use one hand-written double-sided 8.5″ by 11″ page of notes.
- You have 80 minutes to complete the exam.

You may use this page for scratch-work.

All work on this page will be ignored unless you write & circle "see first page" below a problem.

1. **[5 points per part]** For each of the following functions, compute $f'(x)$

   (a) $f(x) = \ln(\sec(x) + e^x)$

   (b) $f(x) = \arcsin(3x^2)$

   (c) $f(x) = (\cos(x) + 2)^{\sqrt{x}}$

2. **[12 points]** Consider the following parametric curve on the domain $t > 0$:

$$x(t) = t^2 - 12t + 10\ln(t) \qquad y(t) = 5\arctan(t) - t$$

Find all points on the curve where the tangent line is **vertical**, and all points where it is **horizontal**. (Specify which is which.)

Write your answers in exact form. You do not need to simplify.

3. **[9 points]** Let $f(x) = x\sqrt{4x+1}$.

   Use the linearization of f at $x = 2$ to find an approximate solution to the equation

$$x\sqrt{4x+1} = 5.935.$$

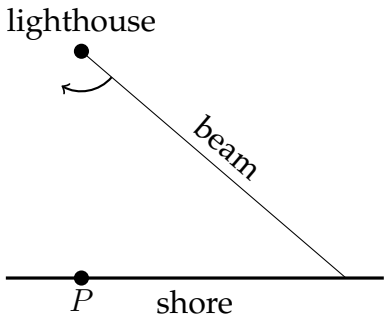
4. **[9 points]** Consider the curve defined implicitly by the equation $\cos(\pi x) + 3^y = x^2 y + 6$.

   Find the equation of the line tangent to this curve at the point $(1, 2)$.

5. **[15 points]** A lighthouse is located on an island 500 meters from the nearest point P on a straight shoreline. Its beam rotates at a constant speed.

   When the beam hits a point on the shore 100 meters from P, it's moving at 150 meters per second along the shoreline.

   How long does it take the beam to make one complete revolution?



You may use this page for scratch-work.

All work on this page will be ignored unless you write & circle "see back page" below a problem.

You may use this page for scratch-work.

All work on this page will be ignored unless you write & circle "see back page" below a problem.