Math 124 Section **Midterm II, November 15** **Autumn 2022**

HONOR STATEMENT
I affirm that my work upholds the highest standards of honesty and academic integrity at the University of Washington, and that I have neither given nor received any unauthorized assistance on this exam.

Name

Signature

Student ID #

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10	10	10	10	10	10	10	10	80

- You have 80 minutes for 8 problems. Check your copy of the exam for completeness.
- You are allowed to use a hand written sheet of paper (8x11 in), back and front.
- Calculator : TI 30 X.
- Justify all your answers and show your work for credit.
- Some credit is given for adhering to formal aspects such as keeping the limit symbol until you take the limit, setting correct parentheses etc.
- All answers must be exact, no rounding.

Do not open the test until everyone has a copy and the start of the test is announced.

GOOD LUCK!

Problem 1. Find the derivative of

$$f(x) = \arctan\left(5x + \sin(x + x^2)\right) + \ln(2x^2)$$

Problem 2. Find y' for the implicitly defined curved $x^y = y^x$

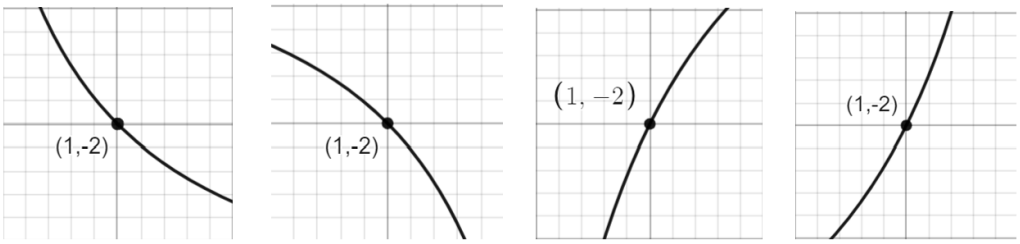
Problem 3. Consider the function

$$f(x) = x^{\sin(\pi x)}.$$

Find the tangent line equation to its graph at $x = \frac{1}{2}$. Show all your work and keep values exact.

Problem 4. Use linearization to approximate $\sqrt{99.98}$. Round to 3 decimal places. Is it an over- or an underestimate?

Problem 5. Which of the options (A)-(D) matches the curve $x^2y^2 + xy = 2$ close to the point $(1, -2)$ best? Justify your answer.



(A) (B) (C) (D)

Problem 6. Consider the curve defined by the parametric equations

$$x(t) = t^4, \quad y(t) = t^4 - t^2.$$

We assume that $t > 0$. At which point(s) on the curve does the tangent line have slope -1? Keep exact values.

Problem 7. A kite 100ft above the ground moves **horizontally** at a speed of 8ft/s. At what rate (in rad/s) is the angle between the string and the horizontal changing when 200ft of string has been let out?

(a) Sketch the situation and label all relevant quantities.

(b)
- KNOWN rate:
- WANTED rate:

(c) Relate and find the value at the instant. Do not forget units in your final answer.

Problem 8. At noon, ship A is 100km west of ship B. Ship A is sailing south at 35km/h and ship B is sailing north at 25km/h. How fast is the distance between the two ships changing at 4pm?

(a) Sketch the situation and label all relevant quantities.

(b)
- KNOWN rate:

- WANTED rate:

(c) Relate and find the value at the instant. Do not forget units in your final answer.