AMAT112: Calculus I
Worksheet 4

Due: Friday, March 29, in Class or digitally

—— Instructions ——

- This homework should be submitted in class or digitally on the date listed above.
- There are three main ways you might want to write up your work.
  - Write on this pdf using a tablet
  - Print this worksheet and write in the space provided
  - Write your answers on paper, clearly numbering each question and part.
    - If using either of the last two options, you can use an app such as Microsoft Lens to take pictures of your work with your phone and convert them into a single pdf file.
- **You must show all work**. You may receive zero or reduced points for insufficient work. **Your work must be neatly organised and written**. You may receive zero or reduced points for incoherent work.
- If you are writing your answers on anything other than this sheet, you should only have **one question per page**. You can have parts a), b) and c) on the page for example, but problems 1) and 2) should be on separate pages.
- **Put a box or circle around your final answer** for each question.
- The problems on this assignment will be **graded on correctness and completeness**.
- These problems are designed to be done without a calculator. Whilst there is nothing stopping you using a calculator when working through this assignment, be aware of the fact that you are not permitted to use calculators on exams so you might want to practice without one.

1. These two problems concern the derivatives of inverse functions.

   a. If $f(x) = x^3 + x$ and $h(x)$ is the inverse of $f(x)$, find $h'(2)$.

   b. Calculate y', given the function $y = 2x \arcsin\left(\sqrt[3]{3x+1}\right)$. You do not need to simplify.

2. Find the equation of the tangent line at $(\pi, 1)$ for the relation $y \cos x = x^2 + y^2$.

3. This problem will consider the function

$$g(x) = \ln\left(\frac{x(x^2+1)^4}{\sqrt[3]{2x-1}}\right).$$

(a) Use the derivative rules to find $g'(x)$.

(b) Use the properties of logarithms to find $g'(x)$.

4. A kite 100 feet above the ground moves horizontally at a speed of 8 feet per second. At what rate is the angle between the string and the horizontal decreasing when 200 feet of string has been let out? **Include units of measure in your answer.**

5. A spotlight on the ground shines on a wall 12 meters away. If a person 2 meters tall walks from the spotlight toward the building at a rate of 1.6 meters per second, how fast is the length of their shadow on the building decreasing when the distance between the spotlight and the person is 8 meters? **Include units of measure in your answer.**

   Let ____ represent the distance between the person and the spotlight.

   Let ____ represent the length of the shadow.