MEMORIAL UNIVERSITY OF NEWFOUNDLAND

DEPARTMENT OF MATHEMATICS AND STATISTICS

ASSIGNMENT 6 **MATHEMATICS 1000** FALL 2024

Due: Friday, November 1st, 2024 at 11:59pm. See the Gradescope Handout for submission information.

> **Note:** You should complete the WeBWorK problem sets "The Chain Rule", "Derivatives of Exponential Functions" and "Implicit Differentiation" as well as Worksheets 3.2 and 3.3, before you work on this assignment.

1. Differentiate each of the following functions.

   (a) $g(t) = (t^4 + 3t)^7(5t^2 - 9)^4$

   (b) $y = e^{\sqrt{x^2+4}}$

   (c) $f(x) = \sin\left(\dfrac{5^x}{x^5}\right)$

   (d) $y = \dfrac{\sec(x^2)}{x^2 + 1}$

2. The curve defined by the equation

$$3(x^2 + y^2)^2 = 100xy$$

   is known as a *lemniscate*. (Its graph is shown below.) Find the equation of the tangent line to the lemniscate at the point $(1, 3)$.

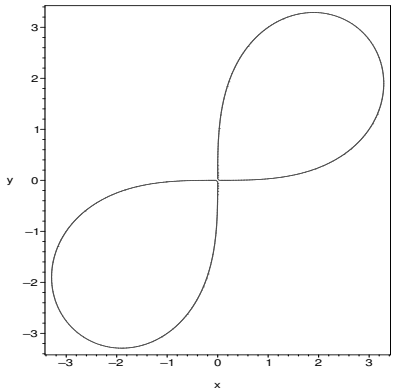

Figure 1: The graph of the equation $3(x^2 + y^2)^2 = 100xy$.