Math 115 Classwork 5

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1. For each function below, find a formula for the derivative. Sketch a graph of the derivative, carefully indicating any points where it does not exist. Explain why it does not exist.

   i). \( f(x) = 3x + 1 \) for \( x \geq 0 \)

   \( 3^{2x} \) for \( x < 0 \)

   ii). \( f(x) = \begin{cases} x^5 & \text{for } x \geq 0 \\ -x^5 & \text{for } x < 0 \end{cases} \)

   iii). \( f(x) = 2x^{1/3} + 1 \)
iv). \( f(x) = \frac{|x|}{x} \)

2. Find all values of \( a \) such that the function \( f(x) = xe^{ax} \) has an inflection point at \( x = 1 \).

2. Use implicit differentiation to find the points on the ellipse \( \frac{x^2}{4} + \frac{y^2}{9} = 1 \) where the tangent line has slope 1.