

Math 4310 Introduction to Analysis
Homework Set 5

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Problem 1: Show that the function $\mathbb{R}_{>0} \rightarrow \mathbb{R}$, $x \mapsto x^x$ is differentiable, and compute its derivative. (4P)

Problem 2: Determine the derivatives of the following functions on their maximal domains:

$$\begin{array}{ll} \text{a) } f(x) = \frac{x^2 - 5x + 6}{x^2 - 3x + 2}, & \text{b) } f(x) = \ln(x + \sqrt{x^2 + 1}), \\ \text{c) } f(x) = \ln(x + \sqrt{x^2 - 1}), & \text{d) } f(x) = \sqrt{|x|^3}. \end{array}$$

(8P)

Problem 3: Show that the function $f : \mathbb{R} \rightarrow \mathbb{R}$, $x \mapsto x + \exp(x)$ is invertible, and compute the derivative of f^{-1} at $y = 1$. (4P)