

May 9, 2024

INFINITESIMAL ANALYSIS 88-503 HOMEWORK SET 1

Due Date: 19 may '24

1. Let $e = \lim_{n \rightarrow \infty} (1 + \frac{1}{n})^n$ and assume known the exponential function e^x . Use the transfer principle to formulate a definition of the natural logarithm function $\ln x$.
2. Let $\epsilon > 0$ be an infinitesimal. Use the transfer principle to prove that ϵ^2 is also an infinitesimal.
3. Suppose $x \approx r$ where r is a real number, and assume $r \neq 0$. Prove that $x \neq 0$.
4. Let H be a negative infinite number. Prove that every number which is less than H is also negative infinite.
5. (Optional) Let H be a positive infinite number. Calculate the standard part **sh** of $(1 + \frac{1}{H})^H$.