

Introduction to Real Analysis, Quiz 12

1. (32 pts) State and prove *Mean Value Theorem*.
2. (28 pts) Differentiate $f(x) = x^n$ with careful $\epsilon - \delta$ argument.
3. (28 pts) Discuss the continuity for the Dirichlet function.
4. (26 pts) Describe and prove *the quotient rule* for differentiation.
5. (24 pts) Let $f : \mathbb{R} \rightarrow \mathbb{R}$ be a monotone function, prove that f has at most countably infinite discontinuities.