Mathematical Science I

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Homework 3 (Due: May 25)

Problem 1 Let $C([a,b])$ be the set of all continuous functions $f : [a,b] \to \mathbb{R}$ and define

$$d_2(f,g) := \left[\int_a^b \{f(x) - g(x)\}^2 \, dx \right]^{1/2}$$

for $f, g \in C([a,b])$. Show that $(C([a,b]), d_2)$ is a metric space.

Problem 2 Let (X,d) be a metric space. Prove that the function

$$\widetilde{d}(x,y) := \frac{d(x,y)}{1+d(x,y)} \quad (x,y \in X)$$

is also a metric on X.