1. Prove that \( f(x) = 2x \) is uniformly continuous on \( \mathbb{R} \), and \( g(x) = x^2 \) is not.

2. Prove that if \( I \) is an interval and \( f : I \rightarrow \mathbb{R} \) satisfies:
\[
\exists M \in \mathbb{R} \text{ such that } |f'(x)| \leq M \forall x \in I,
\]
then \( f \) is uniformly continuous on \( I \).

3. Give an example to show that the condition in (1.1) is not necessary for \( f \) to be uniformly continuous.

4. Let \( a = (1, 1, 1), \ b = (0, 1, 1), \ c = (1, 1, 0) \) be three vectors in \( \mathbb{R}^3 \). Let \( d = xa + yb + zc \).
   (i) Determine the components of \( d \).
   (ii) If \( d = 0 \), prove that \( x = y = z = 0 \).
   (iii) Find \( x, y, z \) so that \( d = (1, 2, 4) \).
   (iv) Calculate \( a \cdot b \) and \( a \cdot (b - c) \).

5. Let \( a = (2, 1, 1, 1), \ b = (0, 1, 1, -1), \ c = (1, -1/2, -1/2, 3/2) \) be three vectors in \( \mathbb{R}^4 \). Let \( d = xa + yb + zc \).
   (i) Determine the components of \( d \).
   (ii) If \( d = 0 \), must \( x = y = z = 0 \)?
   (iii) Find \( x, y, z \) so that \( d = (6, 1, 1, 5) \).
   (iv) Calculate \( a \cdot b \) and \( a \cdot (b - c) \).

6. Let \( a = (1, 2, 3, 4) \) and \( b = (1, 1, 1, 1) \). Calculate the orthogonal projection of \( a \) along \( b \), the orthogonal projection of \( b \) along \( a \), and the angle between \( a \) and \( b \).

7. Three vectors \( a, b, c \) in \( \mathbb{R}^5 \) satisfy
\[
\|a\| = \|c\| = 5, \quad \|b\| = 1, \quad \|a - b + c\| = \|a + b + c\|.
\]
   If the angle between \( a \) and \( b \) is \( \pi/8 \), what is the angle between \( b \) and \( c \)?