

1. State the Bolzano-Weierstrass Theorem.
2. Give the definition of what we mean by " f is uniformly continuous on the set S ."
3. State what we mean by " f is NOT uniformly continuous on the set S ."
4. Show $f(x) = 5x$ is uniformly continuous on \mathbb{R} .
5. Show $f(x) = 5x^2$ is uniformly continuous on $[-2, 2]$.
6. Show $f(x) = 5x^2$ is NOT uniformly continuous on \mathbb{R} .
7. Show $f(x) = \frac{1}{x}$ is NOT uniformly continuous on $(0, 1)$.
8. Show $f(x) = \frac{1}{x}$ is uniformly continuous on $(1, 2)$.
9. Using the $\varepsilon - \delta$ property of continuity, prove that the function f defined below is continuous at $x = 2$.

$$f(x) = \begin{cases} 3(x-2) \cos\left(\frac{1}{x-2}\right), & x \neq 2 \\ 0, & x = 2. \end{cases}$$