#1 Define $f : \mathbb{R} \to \mathbb{R}$ by $f(x) = x^2 - 3x + 5$. Use the definition (of continuity) to prove that f is continuous at 2.

#2 Prove: Let $D \subset \mathbb{R}$. Let $f : D \to \mathbb{R}$ be continuous at $c \in D$. Prove that there exists an $M > 0$ and a neighborhood U of c such that $|f(x)| \leq M$ for all $x \in U \cap D$.

#3 Prove: Let $f : \mathbb{R} \to \mathbb{R}$ be a continuous function and let $k \in \mathbb{R}$. Prove that the set $f^{-1}(\{k\})$ is closed.

#4 Suppose f is a real function defined on $\mathbb{R}$ which satisfies $\lim_{h \to 0}[f(x + h) - f(x - h)] = 0$ for every $x \in \mathbb{R}$. Does this imply f is continuous?

#5 If f is a continuous mapping of a metric space X into a metric space Y, prove that $f(\overline{E}) \subset \overline{f(E)}$ for every set $E \subset X$.

6 Show the equation $3^x = x^2$ has at least one real solution.