Homework #2

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1. Sundaram, #23, p. 68.
2. Sundaram, #25, p. 68.
3. Let (X, d) be a metric space. Prove the following statement : $A \subset X$ is closed iff for every sequence $\{x_n\} \subset A$, $x_n \to x$ implies $x \in A$.
4. Sundaram, #52, p. 72.
5. Let $f : \mathbb{R} \times \mathbb{R} \to \mathbb{R}$ be defined by :

$$f(x, y) = \begin{cases} \frac{xy}{x^2+y^2}, & \text{if } (x, y) \neq (0, 0) \\ 0, & \text{if } (x, y) = (0, 0) \end{cases}$$

   (a) Show that f is continuous in each variable separately.

   (b) Compute the function $g(x) = f(x, x)$.

   (c) (c) Show that f is not continuous.