Definition 5.2.4. Let $f : D \to \mathfrak{R}$. The function f has a *relative (local) maximum* at a point $x = c \in D$ if and only if there exists $\delta > 0$ such that $f(c) \geq f(x)$ for every $x \in (c - \delta, c + \delta) \cap D$.

For a *relative (local) minimum,* we reverse the inequality to $f(c) \leq f(x)$. A function f has a *relative (local) extremum* at $x = c$ if it has a relative maximum or a relative minimum at $x = c$. Thus, intuitively a relative extremum is either the highest or the lowest point the function attains in some neighborhood containing $x = c$. Note that relative extremum could very well occur at an endpoint of some interval. In Figure 5.2.1 we have a relative minimum at $x = a$ and $x = d$, a relative minimum at every point $(x, f(x))$ with $x \in (b, c)$, a relative maximum at every point $(x, f(x))$ with $x \in [b, c]$, and no extremum at $x = e$.

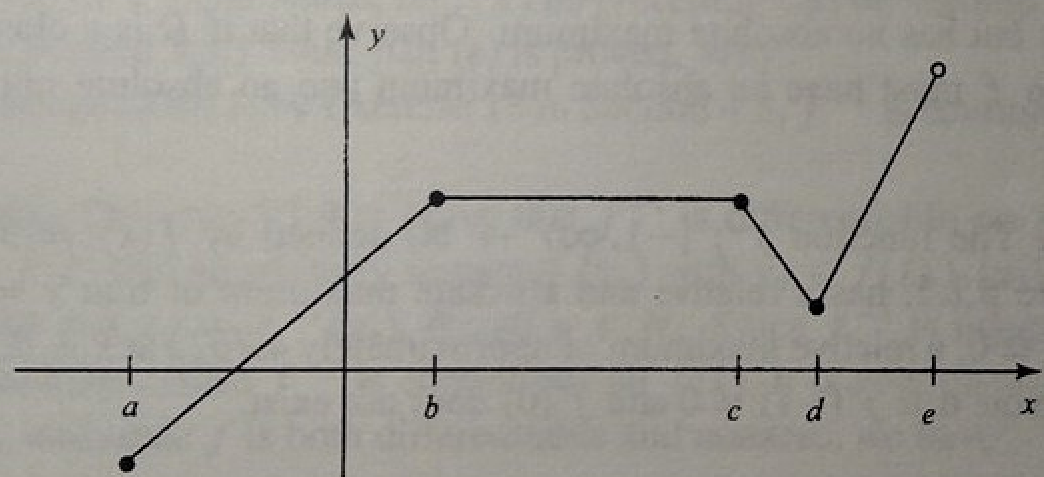

Figure 5.2.1