1. Let \( f \) be the function defined on the interval \([0, 2]\) by

\[
 f(x) = \begin{cases} 
 2x, & \text{if } 0 \leq x \leq 1 \\
 4, & \text{if } 1 < x \leq 2 .
\end{cases}
\]

The graph of \( y = f(x) \) is shown below.

(a) Find \( \lim_{x \to 1} f(x) \), if it exists. If the limit does not exist, explain why.

(b) Explain why there can be no value of \( \delta > 0 \) such that if \( 0 < |x - 1| < \delta \) then \( |f(x) - 4| < 1 \).
(c) Find a value of $\delta > 0$ such that if $0 < |x - 1| < \delta$ then $|f(x) - 4| < 3$.

(d) Explain why the existence of a $\delta > 0$ in part (c) does not contradict your answer to part (a).