Exercise 41

Find the limit, if it exists. If the limit does not exist, explain why.

$$\lim_{x \to 3} (2x + |x - 3|)$$

Solution

Evaluate the left-hand and right-hand limits separately.

$$\lim_{x \to 3^-} (2x + |x - 3|) = \lim_{x \to 3^-} [2x + (3 - x)] = \lim_{x \to 3^-} (3 + x) = 6$$

$$\lim_{x \to 3^+} (2x + |x - 3|) = \lim_{x \to 3^+} [2x + (x - 3)] = \lim_{x \to 3^+} (3x - 3) = 6$$

Since both these limits are equal,

$$\lim_{x \to 3} (2x + |x - 3|) = 6.$$

The graph of the function versus x confirms this result.