

Calculus Worksheet: Limits of Functions (2)

Find the following limits

$$1. \lim_{x \rightarrow 0} \frac{x^2 - 16}{x^2 + 2x - 24} = \frac{-16}{-24} = \frac{2}{3}$$

$$2. \lim_{x \rightarrow -1} \frac{x^2 - 4x - 5}{|x + 1|}$$

We need to find the above limit as $x \rightarrow -1^-$ and $x \rightarrow -1^+$

(A) As $x \rightarrow -1^+$ right $x + 1 > 0 \Rightarrow |x + 1| = x + 1$

$$= \lim_{x \rightarrow -1^+} \frac{x^2 - 4x - 5}{x + 1} = \lim_{x \rightarrow -1^+} \frac{(x + 1)(x - 5)}{(x + 1)} = \frac{-6}{1}$$

(B) As $x \rightarrow -1^-$ left $x + 1 < 0 \Rightarrow |x + 1| = -(x + 1)$

$$= \lim_{x \rightarrow -1^-} \frac{x^2 - 4x - 5}{-(x + 1)} = \lim_{x \rightarrow -1^-} \frac{(x + 1)(x - 5)}{-(x + 1)} = \frac{6}{-1}$$

The limits from the left and from the right are different hence the limit does not exist.