

Exercise 14

Evaluate the limit, if it exists.

$$\lim_{x \rightarrow 4} \frac{x^2 + 3x}{x^2 - x - 12}$$

Solution

Factor the numerator and denominator and cancel the common factors.

$$\lim_{x \rightarrow 4} \frac{x^2 + 3x}{x^2 - x - 12} = \lim_{x \rightarrow 4} \frac{x(x + 3)}{(x - 4)(x + 3)} = \lim_{x \rightarrow 4} \frac{x}{x - 4}$$

This limit does not exist because the left-hand and right-hand limits are not equal.

$$-\infty = \lim_{x \rightarrow 4^-} \frac{x}{x - 4} \neq \lim_{x \rightarrow 4^+} \frac{x}{x - 4} = \infty$$