Question

f(x)=(x^2-16)/(x^2+5x+4)

limit of f(x) as x approaches -4 from the left

limit of f(x) as x approaches -1

Solution

So, $f(x) = \dfrac{x^2 - 16}{x^2 + 5x + 4}$. Then

$$\lim_{x \to -4^-} f(x) = \lim_{x \to -4^-} \frac{x^2 - 16}{x^2 + 5x + 4} = \lim_{x \to -4^-} \frac{(x-4)(x+4)}{(x+1)(x+4)} =$$

$$= \lim_{x \to -4^-} \frac{x-4}{x+1} = \lim_{x \to -4} \frac{x-4}{x+1} = \frac{-4-4}{-4+1} = \frac{-8}{-3} = \frac{8}{3},$$

$$\lim_{x \to -1} f(x) = \lim_{x \to -1} \frac{x^2 - 16}{x^2 + 5x + 4} = \lim_{x \to -1} \frac{(x-4)(x+4)}{(x+1)(x+4)} =$$

$$= \lim_{x \to -1} \frac{x-4}{x+1} = \infty.$$

Answer:

$$\lim_{x \to -4^-} f(x) = \frac{8}{3},$$

$$\lim_{x \to -1} f(x) = \infty.$$