

Unit 1. Continuity - Limits

Limits of Polynomial and Rational Functions

Ex. 1 Find $\lim_{x \rightarrow 2} 2x^2 + 5x - 7$

In general,

Ex. 2 Find $\lim_{x \rightarrow 3} \frac{x - 3}{x^2 - 4x + 3}$

In general,

Ex. 3 Find $\lim_{x \rightarrow -2} \frac{x^2 + x - 2}{x^2 - 4}$ or show it does not exist.

Ex. 4 Consider $\lim_{x \rightarrow -2} \frac{x-1}{x+2}$

Challenge

a. A function $g(x)$ is the ratio of two quadratic polynomials. The numerator is $x^2 - 1$ and it is known that the graph $y = g(x)$ has a vertical asymptote at $x = 2$. It is also known that g has a removable discontinuity at $x = 1$, and that $\lim_{x \rightarrow 1} g(x) = -2$

i. Construct an equation for the function $g(x)$ and evaluate $\lim_{x \rightarrow \infty} g(x)$

ii. Sketch the graph of $y = g(x)$

b. Given the function $f(x) = \frac{x^3 + ax^2 + bx + 5}{x^3 + 2x^2 - x - 2}$, determine whether there are numbers a and b such that

both $\lim_{x \rightarrow 1} f(x)$ exists, and $\lim_{x \rightarrow -1} f(x)$, if so, evaluate both limits.