



Quiz # 01
Math 101 Section 01 Calculus I
30 September 2025, Tuesday
Instructor: Ali Sinan Sertöz
Solution Key

Bilkent University

Q-1) Consider the rational function $f(x) = \frac{x^2 + x - 2}{x^2 - 4x + 3}$. Calculate the following limits if they exist, and explain why if they do not exist. Use **only** the techniques we covered in class!

(i) $\lim_{x \rightarrow 1} f(x)$ (ii) $\lim_{x \rightarrow 2} f(x)$ (iii) $\lim_{x \rightarrow -2} f(x)$ (iv) $\lim_{x \rightarrow 3} f(x)$ (v) $\lim_{x \rightarrow \infty} f(x)$

Grading: 2+2+2+2+2=10 points

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Solution:

(i) $\lim_{x \rightarrow 1} f(x) = \lim_{x \rightarrow 1} \frac{(x-1)(x+2)}{(x-1)(x-3)} = \lim_{x \rightarrow 1} \frac{x+2}{x-3} = -\frac{3}{2}$.

(ii) $\lim_{x \rightarrow 2} f(x) = f(2) = -4$.

(iii) $\lim_{x \rightarrow -2} f(x) = f(-2) = 0$.

(iv) $\lim_{x \rightarrow 3} f(x) = \lim_{x \rightarrow 3} \frac{(x-1)(x+2)}{(x-1)(x-3)}$ does not exist since the denominator vanishes but the numerator does not at $x = 3$.

(v) $\lim_{x \rightarrow \infty} f(x) = \lim_{x \rightarrow \infty} \frac{x^2 + x - 2}{x^2 - 4x + 3} = \lim_{x \rightarrow \infty} \frac{1 + \frac{1}{x} - \frac{2}{x^2}}{1 - \frac{4}{x} + \frac{3}{x^2}} = 1$.