Group Work: Guessing Limits by Substituting in Numbers

Without using a calculator, answer the following questions about the function

\[ f(x) = \frac{x^2 - 5x + 6}{x - 3} \]

Part 1: Function Values

(1) Find \( f(1) \).

(2) Find \( f(2) \).

(3) Find \( f(3) \).

(4) Find \( f(3.1) \) by substituting \( x = 3.1 \) into the above expression. No calculators.

(5) Factor \( f \). (Factor the numerator.) (Check your factorizations by multiplying.)

(6) Are you allowed to cancel factors in the factored form of \( f \)? Explain why you think you are allowed to cancel, or why you are not.

(7) Find \( f(1) \) by substituting \( x = 1 \) into the factored version of \( f \).

(8) Find \( f(2) \) by substituting \( x = 2 \) into the factored version of \( f \).

(9) Find \( f(3) \) by substituting \( x = 3 \) into the factored version of \( f \).

(10) Find \( f(3.1) \) by substituting \( x = 3.1 \) into the factored version of \( f \).
Part 2: Limits
Using the factored form of $f$, compute the following values and guess the limits.

(Again, no calculators)

(11) $f(3.1) =$

(12) $f(3.01) =$

(13) $f(3.001) =$

(14) $f(3.0001) =$

(15) Guess $\lim_{x \to 3^+} f(x) =$

(16) $f(2.9) =$

(17) $f(2.99) =$

(18) $f(2.999) =$

(19) $f(2.9999) =$

(20) Guess $\lim_{x \to 3^-} f(x) =$

(21) Guess $\lim_{x \to 3} f(x) =$
Part 3: Generalizing to another similar function. (Again, no calculators.)

\[ g(x) = \frac{x - 3}{x^2 - 5x + 6} \]

(22) Factor \( g \). (Factor the denominator.) (Check your factorizations by multiplying.)

(23) Find \( g(1) \)

(24) Find \( g(2) \)

(25) Find \( g(3) \)

Using the factored form of \( g \), compute the following values and guess the limits.

(26) \( g(3.1) = \)

(27) \( g(3.01) = \)

(28) \( g(3.001) = \)

(29) Guess \( \lim_{x \to 3^+} g(x) = \)

(30) \( g(2.9) = \)

(31) \( g(2.99) = \)

(32) \( g(2.999) = \)

(33) Guess \( \lim_{x \to 3^-} g(x) = \)

(34) Guess \( \lim_{x \to 3} g(x) = \)
Using the factored form of $g$, compute the following values and guess the limits.

(Again, no calculators.)

(35) $g(2.1) =$

(36) $g(2.01) =$

(37) $g(2.001) =$

(38) Guess $\lim_{x \to 2^+} g(x) =$

(39) $g(1.9) =$

(40) $g(1.99) =$

(41) $g(1.999) =$

(42) Guess $\lim_{x \to 2^-} g(x) =$

(43) Guess $\lim_{x \to 2} g(x) =$