1. This quiz concerns the function \( f(x) = \frac{x^2 - x - 6}{x^2 - 4x + 3} = \frac{(x-3)(x+2)}{(x-3)(x-1)} = \frac{x+2}{x-1} \). (Cancellation possible only if \( x \neq 3 \))

(a) Find the intervals on which \( f(x) \) is continuous.

\( f(x) \) is a continuous function divided by a continuous function so it will be continuous wherever its denominator is not zero, i.e., \(( -\infty, 1 ) \cup (1, 3) \cup (3, \infty)\).

(b) Find the horizontal asymptotes (if any).

\[
\lim_{x \to \infty} f(x) = \lim_{x \to \infty} \frac{x^2 - x - 6}{x^2 - 4x + 3} = \lim_{x \to \infty} \frac{1}{1} = 1 \quad \text{so \ line \ } y = 1 \text{ \ is \ horizontal \ asymptote}
\]

(c) Find the vertical asymptotes (if any).

Denominator of \( f(x) \) is zero for \( x = 1 \) and \( x = 3 \) so these are the possible locations of vertical asymptotes.

\[
\text{Test } x = 1 \quad \text{lim}_{x \to 1^+} f(x) = \lim_{x \to 1^+} \frac{x+2}{x-1} \quad \text{approaches } 3 \quad = \infty \quad \text{line } x = 1 \text{ \ is \ V.A.}
\]

\[
\text{Test } x = 3 \quad \text{lim}_{x \to 3^+} f(x) = \lim_{x \to 3^+} \frac{x+2}{x-1} = \frac{5 + 2}{3 - 1} = \frac{7}{2} \neq \pm \infty \quad \text{(no V.A. here)}
\]

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1. This quiz concerns the function \( f(x) = \frac{x^2 - 4}{5x^2 - 10x} = \frac{(x+2)(x-2)}{5x(x-2)} = \frac{x+2}{5x} \).

(a) Find the intervals on which \( f(x) \) is continuous.

\( f(x) \) is a continuous function divided by a continuous function so it is continuous wherever its denominator is not zero, i.e., \(( -\infty, 0 ) \cup (0, 2) \cup (2, \infty)\).

(b) Find the horizontal asymptotes (if any).

\[
\lim_{x \to \infty} f(x) = \lim_{x \to \infty} \frac{x^2 - 4}{5x^2 - 10x} = \lim_{x \to \infty} \frac{1}{5} = \frac{1}{5} \quad \text{So \ line \ } y = \frac{1}{5} \text{ \ is \ H.A.}
\]

(c) Find the vertical asymptotes (if any).

Denominator of \( f(x) \) is zero when \( x = 0 \) and \( x = 2 \) so these are the possible locations of vertical asymptotes.

\[
\text{Test } x = 0 \quad \text{lim}_{x \to 0^+} f(x) = \lim_{x \to 0^+} \frac{x+2}{5x} \quad \text{approaches } \frac{0+2}{0} = 2 
\]

\[
\text{Test } x = 3 \quad \text{lim}_{x \to 3^+} f(x) = \lim_{x \to 3^+} \frac{x+2}{5x} = \frac{3+2}{5 \cdot 3} = \frac{5}{15} = \frac{1}{3} \quad \text{(no V.A. here)}
\]