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Group Work GW06 Limits Involving Infinity for a Rational Function

Part I: $f(x) = \dfrac{5x^2 - 40x + 35}{3x^2 - 27x + 42} = \dfrac{5(x-1)(x-7)}{3(x-2)(x-7)}$

(a) Find $f(1)$.

(b) Find $\lim\limits_{x \to 1} f(x)$.

(c) Based on (a),(b), what does the factor $(x-1)$ cause in the graph of $f(x)$?

(d) Find $f(2)$.

(e) Find $\lim\limits_{x \to 2^-} f(x)$.

(f) Find $\lim\limits_{x \to 2^+} f(x)$.

(g) Find $\lim\limits_{x \to 2} f(x)$.

(h) Based on (d),(g), what does the factor $(x-2)$ cause in the graph of $f(x)$?

(i) Find $f(7)$.

(j) Find $\lim_{x\to 7} f(x)$.

(k) Based on (i),(j), what do the factors $\frac{(x-7)}{(x-7)}$ cause in the graph of $f(x)$?

(l) Find $\lim_{x\to \infty} f(x)$.

(m) Based on (l), what is the behavior of the right end of the graph of $f(x)$?

(n) Find $\lim_{x\to -\infty} f(x)$.

(o) Based on (n), what is the behavior of the left end of the graph of $f(x)$?

(p) List all the asymptotes of $f(x)$. Give their line equations and say whether they are horizontal or vertical.

Part II: $g(x) = \dfrac{5x^3 - 75x^2 + 315x - 245}{3x^2 - 27x + 42} = \dfrac{5(x-1)(x-7)^2}{3(x-2)(x-7)}$

(a) Find $g(1)$.

(b) Find $\lim_{x \to 1} g(x)$.

(c) Based on (a),(b), what does the factor $(x - 1)$ cause in the graph of $g(x)$?

(d) Find $g(2)$.

(e) Find $\lim_{x \to 2^-} g(x)$.

(f) Find $\lim_{x \to 2^+} g(x)$.

(g) Find $\lim_{x \to 2} g(x)$.

(h) Based on (d),(g), what does the factor $(x - 2)$ cause in the graph of $g(x)$?

(i) Find $g(7)$.

(j) Find $\lim_{x\to 7} g(x)$.

(k) Based on (i),(j), what do the factors $\frac{(x-7)^2}{(x-7)}$ cause in the graph of $g(x)$?

(l) Find $\lim_{x\to \infty} g(x)$.

(m) Based on (l), what is the behavior of the right end of the graph of $g(x)$?

(n) Find $\lim_{x\to -\infty} g(x)$.

(o) Based on (n), what is the behavior of the left end of the graph of $g(x)$?

(p) List all the asymptotes of $g(x)$. Give their line equations and say whether they are horizontal or vertical.

Part III: $h(x) = \dfrac{5x^2 - 40x + 35}{3x^3 - 48x^2 + 231x - 294} = \dfrac{5(x-1)(x-7)}{3(x-2)(x-7)^2}$

(a) Find $h(1)$.

(b) Find $\lim_{x \to 1} h(x)$.

(c) Based on (a),(b), what does the factor $(x - 1)$ cause in the graph of $h(x)$?

(d) Find $h(2)$.

(e) Find $\lim_{x \to 2^-} h(x)$.

(f) Find $\lim_{x \to 2^+} h(x)$.

(g) Find $\lim_{x \to 2} h(x)$.

(h) Based on (d),(g), what does the factor $(x - 2)$ cause in the graph of $h(x)$?

(i) Find $h(7)$.

(j) Find $\lim_{x\to 7^-} h(x)$.

(k) Find $\lim_{x\to 7^+} h(x)$.

(l) Find $\lim_{x\to 7} h(x)$.

(m) Based on (i)-(l), what do the factors $\frac{(x-7)}{(x-7)^2}$ cause in the graph of $h(x)$?

(n) Find $\lim_{x\to \infty} h(x)$.

(o) Based on (n), what is the behavior of the right end of the graph of $h(x)$?

(p) Find $\lim_{x\to -\infty} h(x)$.

(q) Based on (p), what is the behavior of the left end of the graph of $h(x)$?

(r) List all the asymptotes of $h(x)$. Give their line equations and say whether they are horizontal or vertical.