

Find the following limits, if they exist.

a) $\lim_{x \rightarrow \infty} \frac{7x^2 - x + 1}{3x^2 + 5x - 5}$ and $\lim_{x \rightarrow -\infty} \frac{7x^2 - x + 1}{3x^2 + 5x - 5}$.

b) $\lim_{x \rightarrow \infty} \frac{8x - 9}{2x + 4}$ and $\lim_{x \rightarrow -\infty} \frac{8x - 9}{2x + 4}$.

c) $\lim_{x \rightarrow \infty} \frac{x - 8}{x^2 + 7}$ and $\lim_{x \rightarrow -\infty} \frac{x - 8}{x^2 + 7}$.

Find the following limits, if they exist.

d) $\lim_{x \rightarrow \infty} \frac{\sqrt{4x^6 - x}}{x^3 + 3}$ and $\lim_{x \rightarrow -\infty} \frac{\sqrt{4x^6 - x}}{x^3 + 3}$.

e) $\lim_{x \rightarrow \infty} (\sqrt{25x^2 + x} - 5x)$ and $\lim_{x \rightarrow -\infty} (\sqrt{25x^2 + x} - 5x)$.

Find the following limits, if they exist.

d) $\lim_{x \rightarrow \infty} \frac{\sqrt{4x^6 - x}}{x^3 + 3}$ and $\lim_{x \rightarrow -\infty} \frac{\sqrt{4x^6 - x}}{x^3 + 3}$.

e) $\lim_{x \rightarrow \infty} (\sqrt{25x^2 + x} - 5x)$ and $\lim_{x \rightarrow -\infty} (\sqrt{25x^2 + x} - 5x)$.

f) $\lim_{x \rightarrow -\infty} (x + \sqrt{x^2 + 2x})$

g) $\lim_{x \rightarrow \infty} 6 \cos(x)$

h) $\lim_{x \rightarrow \infty} \frac{x^4 - 3x^2 + x}{x^3 - x + 3}$

Find the horizontal and vertical asymptotes of each curve.

a)

$$y = \frac{8x + 3}{x - 4}$$

b)

$$y = \frac{x^2 + 1}{9x^2 - 80x - 9}$$

c)

$$y = \frac{x^2 - x}{x^2 - 8x + 7}$$

Let P and Q be polynomials with positive coefficients.

a) If the degree of P is less than the degree of Q , what is

$$\lim_{x \rightarrow \infty} \frac{P(x)}{Q(x)}?$$

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c) If the degree of P equals the degree of Q , what is

$$\lim_{x \rightarrow \infty} \frac{P(x)}{Q(x)}?$$

A tank contains 120 L of pure water. Brine that contains 25 g of salt per liter of water is pumped into the tank at a rate of 25 L/min.

- a) Find the concentration of salt after t minutes (in grams per liter).
- b) As t approaches infinity, what does the concentration approach?

Find

$$\lim_{x \rightarrow \infty} (\sqrt{x^2 + cx} - \sqrt{x^2 + dx}).$$

(Here c and d represent arbitrary real numbers.)

Find

$$\lim_{x \rightarrow -\infty} (x^2 + x^3).$$