

1. For each of the following functions compute $\lim_{x \rightarrow +\infty} f(x)$ and $\lim_{x \rightarrow -\infty} f(x)$:

(a) $f(x) = 3x^3 - x^2 + 2x - 7$

(b) $f(x) = \frac{2x + 1}{3x^4 - 2}$

(c) $f(x) = \frac{40x^5 + x^2}{16x^4 - 2}$

(d) $f(x) = \frac{3x^7 - 4x^4 + 1}{2x^7 + 2x}$

(e) $f(x) = \frac{2x}{x^2 + 4}$

Which of the functions above have horizontal asymptotes and what are the asymptotes?

2. Find the following limits, provided they exist:

(a) $\lim_{x \rightarrow +\infty} \frac{2x}{\sqrt{x^2 + 4}}$

(b) $\lim_{x \rightarrow -\infty} \frac{2x}{\sqrt{x^2 + 4}}$

Does the function $f(x) = \frac{2x}{\sqrt{x^2 + 4}}$ have horizontal asymptotes? If yes, describe them?

3. Consider the function $f(x) = \frac{3-x}{x^2-9}$.

(a) Does this function have horizontal asymptotes? Justify your answer with limits.

(b) Does this function have vertical asymptotes? Justify your answer with limits.

(c) Graph this function.