

Calculus AB

3-5

Limits at Infinity

Graph: $f(x) = \frac{1}{x}$

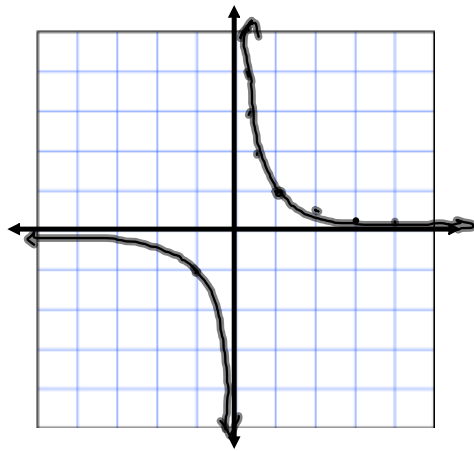
domain: \mathbb{R} except $\{0\}$

range: \mathbb{R} except $\{0\}$

$$\lim_{x \rightarrow 0} \frac{1}{x} = \emptyset$$

$$\lim_{x \rightarrow \infty} \frac{1}{x} = 0$$

$$\lim_{x \rightarrow -\infty} \frac{1}{x} = 0$$



Asymptote Rules - Given: $f(x) = \frac{p(x)}{q(x)}$

Vertical Asymptotes- Where $q(x) = 0$, $q(x)$ is not a Factor of $p(x)$

Hole - Where $q(x) = 0$ and $q(x)$ is a Factor of $p(x)$

Horizontal Asymptotes-

1) degree of $p(x) < q(x) \Rightarrow y = 0$

2) degree of $p(x) = \text{degree of } q(x) \Rightarrow \frac{a}{b} = y$

3) degree of $p(x) > q(x) \Rightarrow \text{none}$

Find the limit.

$$19) \lim_{x \rightarrow \infty} \frac{2x - 1}{3x + 2} = \frac{2}{3}$$

$$21) \lim_{x \rightarrow \infty} \frac{x}{x^2 - 1} = 0$$

$$23) \lim_{x \rightarrow -\infty} \frac{5x^2}{x + 3} \text{ none}$$

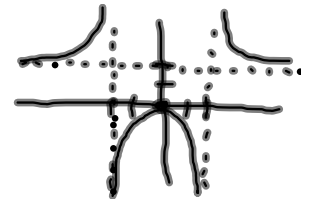
$$25) \lim_{x \rightarrow -\infty} \frac{x}{\sqrt{x^2 - x}}$$

↑

$$= -1$$

$$\frac{x}{|x|} = \begin{cases} 1 & x > 0 \\ -1 & x < 0 \end{cases}$$

Sketch the graph of the equation. Look for extrema, intercepts, symmetry, and asymptotes as necessary. Check with your graphing calculator.



$$55) y = \frac{2x^2}{x^2 - 4}$$

$$\text{domain: } \mathbb{R} \setminus \{ \pm 2 \}$$

$$\text{vertical asymptotes: } x = \pm 2$$

$$\text{horizontal asymptotes: } y = 2$$

$$y\text{-int: } (0, 0)$$

$$x\text{-int: } \{0\}$$

$$\frac{dy}{dx} = \frac{4x(x^2 - 4) - 2x^2(2x)}{(x^2 - 4)^2}$$

$$0 = \frac{-16x}{(x^2 - 4)^2} \quad \text{c.p. } 0 \quad \text{undefined } \pm 2$$

$$y'|_{-1} = + \quad y'|_1 = - \quad / \quad \setminus$$

Pg 199

1-6 all

20-32 even

50-76 even