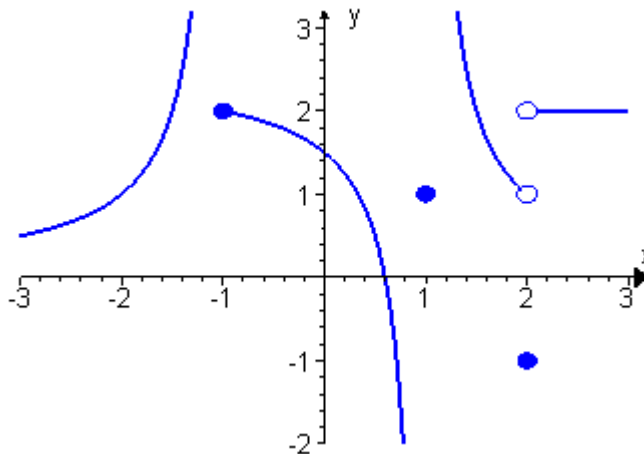


II – Infinite Limits

1. For the function f whose graph is given, find the value of the following limits (or function), or explain why it does not exist.



- | | | | |
|-------------------------------------|-------------------------------------|-----------------------------------|------------|
| a) $\lim_{x \rightarrow -1^+} f(x)$ | b) $\lim_{x \rightarrow -1^-} f(x)$ | c) $\lim_{x \rightarrow -1} f(x)$ | d) $f(-1)$ |
| e) $\lim_{x \rightarrow 1^-} f(x)$ | f) $\lim_{x \rightarrow 1^+} f(x)$ | g) $\lim_{x \rightarrow 1} f(x)$ | h) $f(1)$ |
| i) $\lim_{x \rightarrow 2^-} f(x)$ | j) $\lim_{x \rightarrow 2^+} f(x)$ | k) $\lim_{x \rightarrow 2} f(x)$ | l) $f(2)$ |

2. Evaluate the following limits.

- | | | |
|--|---|--|
| a) $\lim_{x \rightarrow 2^-} \frac{x^2 + 1}{x - 2}$ | b) $\lim_{x \rightarrow 0^+} \frac{\sqrt{4 + 3x^2}}{5x}$ | c) $\lim_{x \rightarrow 0^-} \frac{\sqrt{4 + 3x^2}}{5x}$ |
| d) $\lim_{x \rightarrow -2^-} \frac{x + 2}{x^2 - 4}$ | e) $\lim_{x \rightarrow 3^+} \frac{x^2 + 5x + 1}{x^2 - 2x - 3}$ | f) $\lim_{x \rightarrow 2^-} \frac{x^2 + 4x + 4}{x - 2}$ |
| g) $\lim_{x \rightarrow 1^-} \frac{x^3 + 1}{x^2 - 1}$ | h) $\lim_{x \rightarrow 1^+} \frac{x + x^2}{x^2 + 2x + 1}$ | i) $\lim_{x \rightarrow 3^-} \frac{x^2 - x - 6}{x - 3}$ |
| j) $\lim_{x \rightarrow 1} \frac{x + 2}{x^2 - 2x + 1}$ | k) $\lim_{x \rightarrow 4} \frac{x^2 - 4}{x^2 - 3x - 4}$ | l) $\lim_{x \rightarrow 0} \left(\frac{1}{x} - \frac{2}{x^3 + x} \right)$ |

3. Find all vertical asymptotes.

- | | | |
|-------------------------------------|------------------------------------|---|
| a) $f(x) = \frac{x^2 + 1}{x - 1}$ | b) $f(x) = \frac{x^2 - 1}{x - 1}$ | c) $f(x) = \frac{x^3 - 8}{x^3 + 2x^2 - 2x - 4}$ |
| d) $f(x) = x - 4 - \frac{2}{x - 4}$ | e) $f(x) = \frac{3}{\sqrt{x + 1}}$ | f) $f(x) = \frac{x^2 + 2}{x^3 + x}$ |

4. In the theory of relativity, the mass of a particle with velocity v is

$$m = \frac{m_0}{\sqrt{1 - \frac{v^2}{c^2}}}$$

where m_0 is the mass of the particle when at rest and c is the speed of light. What happens as $v \rightarrow c^-$?

ANSWERS

1. a) 2 b) ∞ c) $\cancel{\neq}$ d) 2 e) $-\infty$ f) ∞ g) $\cancel{\neq}$
 h) 1 i) 1 j) 2 k) $\cancel{\neq}$ l) -1
2. a) $-\infty$ b) ∞ c) $-\infty$ d) $-\frac{1}{4}$ e) ∞ f) $-\infty$ g) $-\infty$
 h) $\frac{1}{2}$ i) 5 j) ∞ k) $\cancel{\neq}$ l) ∞
3. a) $x = 1$ b) None c) $x = -2$, $x = \sqrt{2}$, $x = -\sqrt{2}$
 d) $x = 4$ e) $x = -1$ f) $x = 0$
4. a) $\lim_{v \rightarrow c^-} \frac{m_0}{\sqrt{1 - \frac{v^2}{c^2}}} = \infty$ so the mass of the particle tends towards infinity