

1) Find the limits (if they exist) for the graph of $f(x)$ below.

$$\lim_{x \rightarrow -4^-} f(x) = 0$$

$$\lim_{x \rightarrow -4^+} f(x) = 3$$

$$\lim_{x \rightarrow -4} f(x) = L \neq R \text{ (DNE)}$$

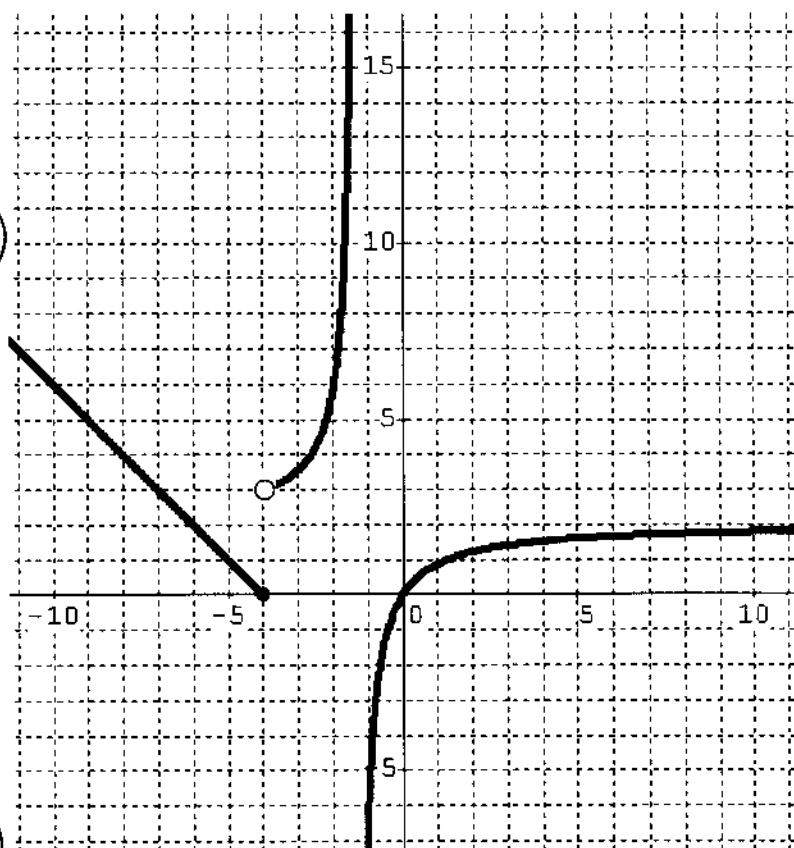
$$\lim_{x \rightarrow -\infty} f(x) = +\infty \text{ (DNE)}$$

$$\lim_{x \rightarrow \infty} f(x) = 2$$

$$\lim_{x \rightarrow 0} f(x) = 0$$

$$\lim_{x \rightarrow -1^-} f(x) = +\infty \text{ (DNE)}$$

$$\lim_{x \rightarrow -1^+} f(x) = -\infty \text{ (DNE)}$$



2) Find the following limits algebraically.

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

0

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

$\frac{1}{2}$

c) $\lim_{x \rightarrow -\infty} \frac{x^3 - x^2 - 2}{-2x^2}$

$-\infty$, DNE

d) $\lim_{x \rightarrow -\infty} \frac{x^3 - x^2 - 2}{-2x^2}$

$+\infty$, DNE

3) Find the following limits algebraically.

$$a) \lim_{x \rightarrow 4^-} \frac{x^2 + 8x + 16}{x + 4} = \frac{(x+4)(x+4)}{(x+4)} \quad 4+4=8$$

- (a) 0 (b) 8 (c) 16 (d) $-\infty$ (DNE) (e) ∞ (DNE)

$$b) \lim_{x \rightarrow -4^-} \frac{x^2 + 8x + 16}{x + 4} = x+4 \rightarrow -4+4=0$$

- (a) 0 (b) 8 (c) 16 (d) $-\infty$ (DNE) (e) ∞ (DNE)

$$c) \lim_{x \rightarrow 5^+} \frac{-x}{x-5} \quad \frac{-5.1}{5.1-5} \quad \frac{-5.1}{0.1} \text{ asymptote at } x=5$$

- (a) 0 (b) 5 (c) $-\frac{1}{5}$ (d) $-\infty$ (DNE) (e) ∞ (DNE)

$$d) \lim_{x \rightarrow 1^-} \frac{-x}{x-5} = \frac{-1}{-4} = \frac{1}{4}$$

- (a) $-\frac{1}{6}$ (b) $\frac{1}{4}$ (c) $\frac{1}{5}$ (d) $-\infty$ (DNE) (e) ∞ (DNE)

$$e) \lim_{x \rightarrow 0^-} \frac{x^2 - x - 12}{x^2 - 4x} = \frac{(x-4)(x+3)}{x(x-4)} \quad \frac{-0.1+3}{-0.1} \text{ asymptote at } 0$$

- (a) -12 (b) 0 (c) 3 (d) $-\infty$ (DNE) (e) ∞ (DNE)

$$f) \lim_{x \rightarrow 3} \frac{x^2 - x - 12}{x^2 - 4x} \rightarrow \frac{x+3}{x} \quad \frac{6}{3}$$

- (a) -3 (b) -2 (c) 2 (d) $-\infty$ (DNE) (e) ∞ (DNE)