2.1 Limits

Consider $f(x)=\frac{x^2-4}{x+4}$. What observations can you make?

How can we describe what happens at x= -2?

Find the Limit: $$\lim_{x\to -3}\frac{x+3}{x^2+x-6}$$

Finding limits Analytically:

Finding limits Graphically:

Finding limits Numerically:

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Find each limit.

$$1.\lim_{x\to 2}\left(x^2+3x-5\right)=$$

$$2.\lim_{x\to \pi}(\sin x\cos x)=$$

$$3.\lim_{x\to 4}\frac{x-4}{x^2-16}=$$

Find the limit.

$$4.\lim_{x\to 0}\frac{\sin x}{x}=$$

$$5.\lim_{x\to 0}\frac{\sin x+x}{x}=$$

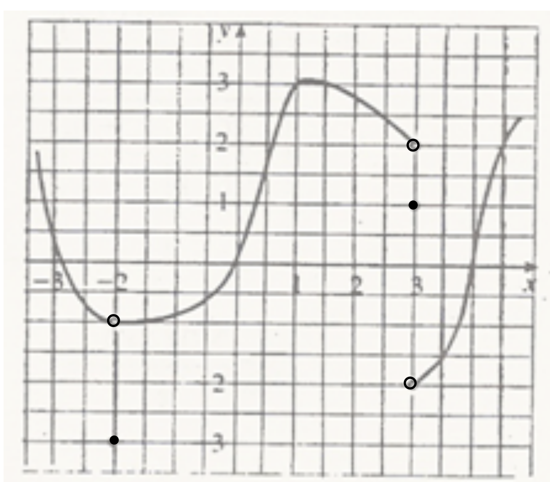
Left and right hand limits.

$$\lim_{x \to c^+} f(x) \qquad \lim_{x \to c^-} f(x)$$

Definition of a limit:

$$\lim_{x \to c} f(x) = L \quad \text{iff} \quad \lim_{x \to c^+} f(x) = \lim_{x \to c^-} f(x) = L$$

the limit doesn't necessarily equal the function!!!



(a) $\lim_{x \to 1} f(x) =$ (b) $\lim_{x \to 3^-} f(x) =$ (c) $\lim_{x \to 3^+} f(x) =$

(d) $\lim_{x \to 3} f(x) =$ (e) $f(3) =$ (f) $\lim_{x \to -2^-} f(x) =$

(g) $\lim_{x \to -2^+} f(x) =$ (h) $\lim_{x \to -2} f(x) =$ (i) $f(-2) =$

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Properties of Limits:

$$1.\ \lim_{x\to a}(f(x)+g(x)) = \lim_{x\to a} f(x) + \lim_{x\to a} g(x)$$

$$2.\ \lim_{x\to a}(f(x)\cdot g(x)) = \lim_{x\to a} f(x) \cdot \lim_{x\to a} g(x)$$

Given that $\lim_{x\to a} f(x) = -3,\ \lim_{x\to a} g(x) = 0,\ \lim_{x\to a} h(x) = 8,$

find the limits that exist. If the limit does not exist, explain why.

(a) $\lim_{x\to a}\left[f(x)+h(x)\right] =$

(b) $\lim_{x\to a}\left[f(x)\right]^2 =$

(c) $\lim_{x\to a}\sqrt[3]{h(x)} =$

(d) $\lim_{x\to a}\dfrac{1}{f(x)} =$

(e) $\lim_{x\to a}\dfrac{f(x)}{h(x)} =$

(f) $\lim_{x\to a}\dfrac{g(x)}{f(x)} =$

(g) $\lim_{x\to a}\dfrac{f(x)}{g(x)} =$

(h) $\lim_{x\to a}\dfrac{2f(x)}{h(x)-f(x)} =$