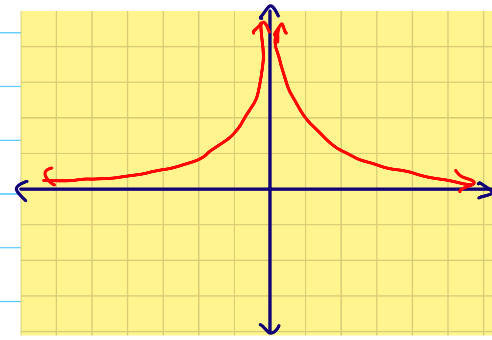
SEP 19

height of curve from left = height of curve from right

if $\underbrace{\lim_{x\to a^-} f(x)}_{} = \underbrace{\lim_{x\to a^+} f(x)}_{}$

the the limit exists

$\lim_{x\to 0} \frac{1}{x^2}$



limit must be finite

and cannot be ∞

this limit is therefore DNE ↗

Does not exist

$$f(x) = \begin{cases} -(x+3)^2+2, & \text{if } x < -2 \\ 0, & \text{if } x = -2 \\ x-1, & \text{if } x > -2 \end{cases}$$

$\lim_{x\to -2} f(x)$

$\lim_{x\to -2^-} (-(x+3)^2+2)$

$= (-(-2+3)^2+2)$

$= -1+2$

$= 1$

$\lim_{x\to -2^+} (x-1)$

$= -2-1$

$= -3$

since $\because \lim_{x\to 2^-} f(x) \neq \lim_{x\to 2^+} f(x)$ therefore $\therefore \lim_{x\to -2} f(x)$ DNE

$$f(x) = \begin{cases} -(x+3)^2+2, & \text{if } x < -1 \\ 0, & \text{if } x = -1 \\ x-1, & \text{if } x > -1 \end{cases}$$

$\lim_{x\to -1} f(x)$

$\lim_{x\to -1^-} (-(x+3)^2+2)$

$= (-(-1+3)^2+2)$

$= -4+2$

$= -2$

$\lim_{x\to -1^+} (x-1)$

$= -1-1$

$= -2$

since $\because \lim_{x\to -1^-} f(x) = \lim_{x\to -1^+} f(x)$ therefore $\therefore \lim_{x\to -1} f(x) = -2$

$\lim_{x\to -1} f(x) = -2$

but $f(x) = 0$

limit does NOT need to be equal to the actual point continuity

if $\lim_{x \to a} f(x) = L$ and $f(a) = L$ / $\lim_{x \to a^-} = f(a) = \lim_{x \to a^+}$

then $f(x)$ is continuous at $x = a$

basically no hole in a curve