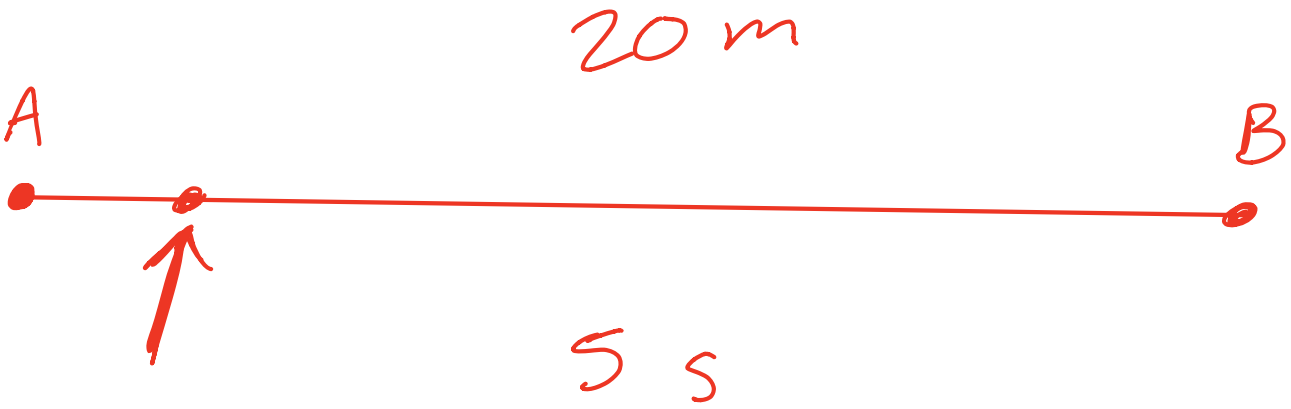
(1) What is the difference between average and instantaneous velocity?



$$V_{ave} = \frac{\Delta d}{\Delta t} = \frac{20\ m}{5\ s} = 4\ m/s$$

② Graph the following one-sided limit:

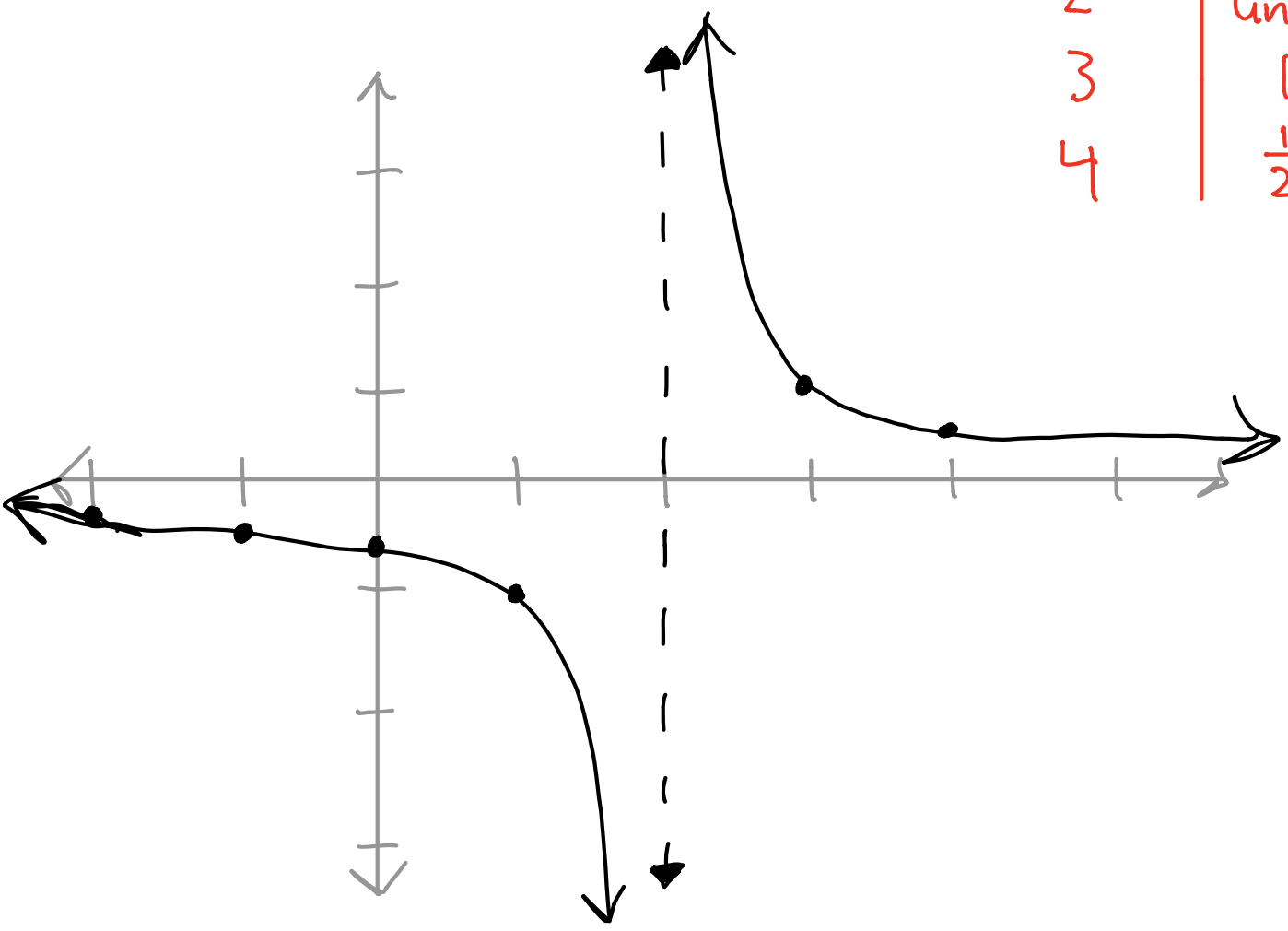
$$\lim_{x \to 2^{\pm}} \frac{1}{x-2}$$

$$\lim_{x \to c} f(x) = f(c)$$

$$\lim_{x \to 2^+} f(x) = \infty$$

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

x	$f(x)$
-2	$-\frac{1}{4}$
-1	$-\frac{1}{3}$
0	$-\frac{1}{2}$
1	-1
2	undef.
3	1
4	$\frac{1}{2}$



③ Evaluate the following limit:

$$\lim_{x \to 2} (x^3 + 5x + 7)$$

↙ Sum Law

$$= \lim_{x \to 2} x^3 + \lim_{x \to 2} 5x + \lim_{x \to 2} 7$$

↙ Constant-multiple Law

$$= \lim_{x \to 2} x^3 + 5 \lim_{x \to 2} x + \lim_{x \to 2} 7$$

$$= 2^3 + 5(2) + 7$$

$$= 8 + 10 + 7$$

$$= \boxed{25}$$

(4) Evaluate the following limit:

$$\lim_{y \to \frac{\pi}{3}} \sin y$$

θ	0	$\frac{\pi}{6}$	$\frac{\pi}{4}$	$\frac{\pi}{3}$	$\frac{\pi}{2}$
sin	0	$\frac{1}{2}$	$\frac{\sqrt{2}}{2}$	$\frac{\sqrt{3}}{2}$	1
cos	1	$\frac{\sqrt{3}}{2}$	$\frac{\sqrt{2}}{2}$	$\frac{1}{2}$	0
tan	0	$\frac{\sqrt{3}}{3}$	1	$\sqrt{3}$	∞

$$\lim_{y \to \frac{\pi}{3}} \sin y = \sin \frac{\pi}{3} = \boxed{\frac{\sqrt{3}}{2}}$$

(5) Consider the following function:

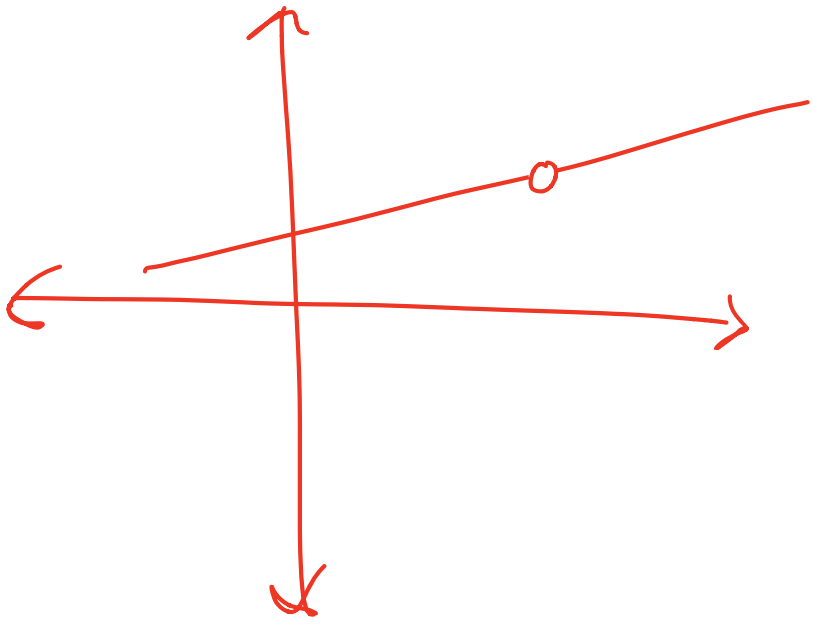
$$f(x) = \frac{x^2 - 16}{x - 4} = \frac{(x-4)(x+4)}{x-4}$$

a) At what x-value is the function undefined?

$x = 4$

b) As the function approaches this x-value, does the limit exist?

yes, it does.



$$f(x) = \frac{\sin x}{x}$$

$$\lim_{x \to 0} \frac{\sin x}{x} = 1$$

x	$f(x)$
-1	0.84
-0.5	0.99958
-0.001	0.999999
0.001	0.999999
0.5	0.99958
1	0.84

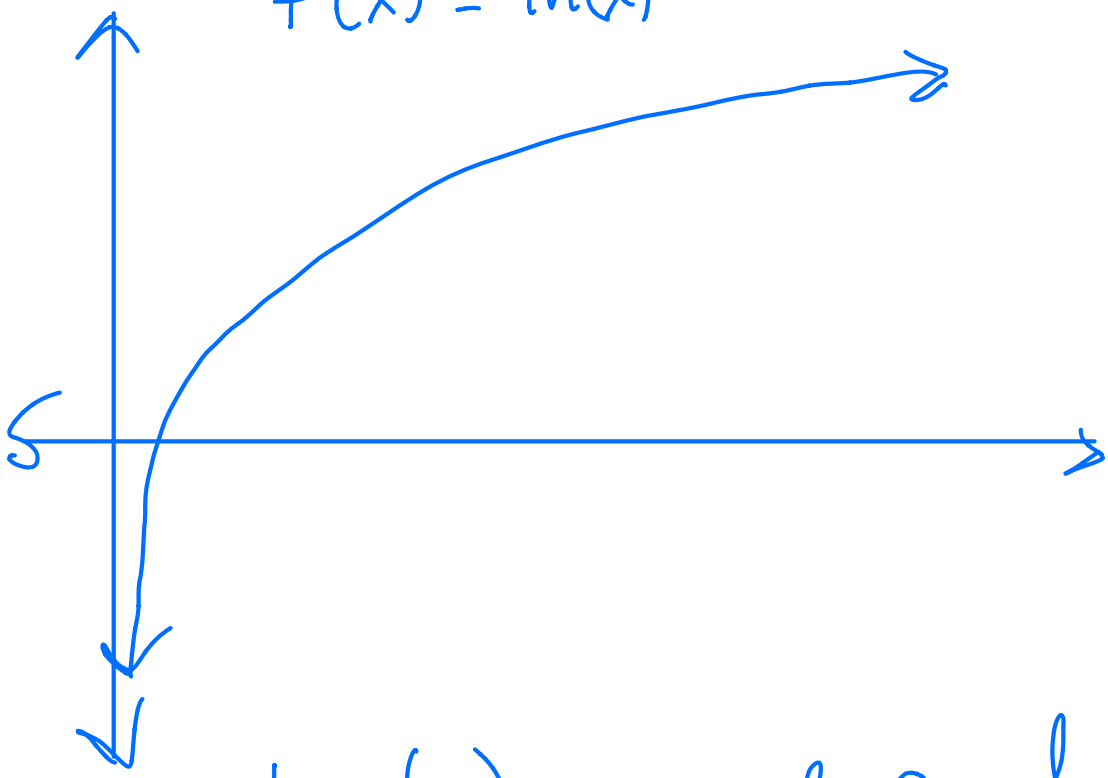
$$\lim_{x \to \frac{5\pi}{2}^-} x^2 \cot x$$

$$\left(\frac{5\pi}{2}\right)^2 \cot\left(\frac{5\pi}{2}\right)$$

$$\cot\left(\frac{\pi}{2}\right) = 0$$

$$\left(\frac{5\pi}{2}\right)^2 \times 0 = 0$$

$f(x) = \ln(x)$



$\ln(0) = \text{undefined}$

$\ln(1) = 0$

$[e \approx 2.7] \Rightarrow \ln(e) = 1$

defined at $x > 0$

$$\lim_{x \to -\sqrt{3}} \frac{8(x^4 - 9)}{(x^2 - 3)}$$

$$\lim_{x \to \sqrt{3}} \frac{8(x^2 - 3)(x^2 + 3)}{(x^2 - 3)}$$

$$\lim_{x \to \sqrt{3}} 8x^2 + 24$$

$$8(-\sqrt{3})^2 + 24$$

$$24 + 24 = 48$$