#1 WW

$s = t^3/6$

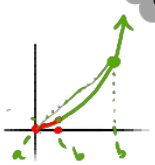
Avg Velocity

Formula: A.V. on $[a,b]$ of $f(x)$ is

position as function of time

$$\frac{f(b)-f(a)}{b-a}$$

"slope formula b/w a & b"



$[1,3]$ & $f = t^3/6$

t	1	3
$t^3/6$	$1/6$	$27/6$

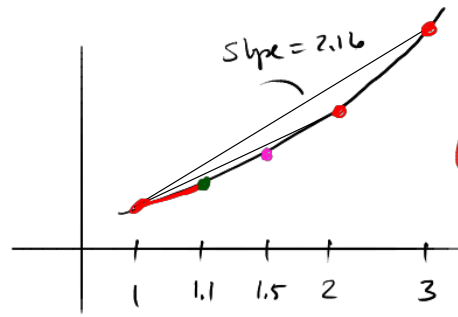
← time

← displacement

On $[1,3]$, A.V. is $\dfrac{27/6 - 1/6}{3-1} = \dfrac{\frac{26}{6}}{2} = \dfrac{26}{12} = 2\tfrac{1}{6} = 13/6$ $\quad 2.1\overline{6}$ (a)

slope

Instantaneous Velocity

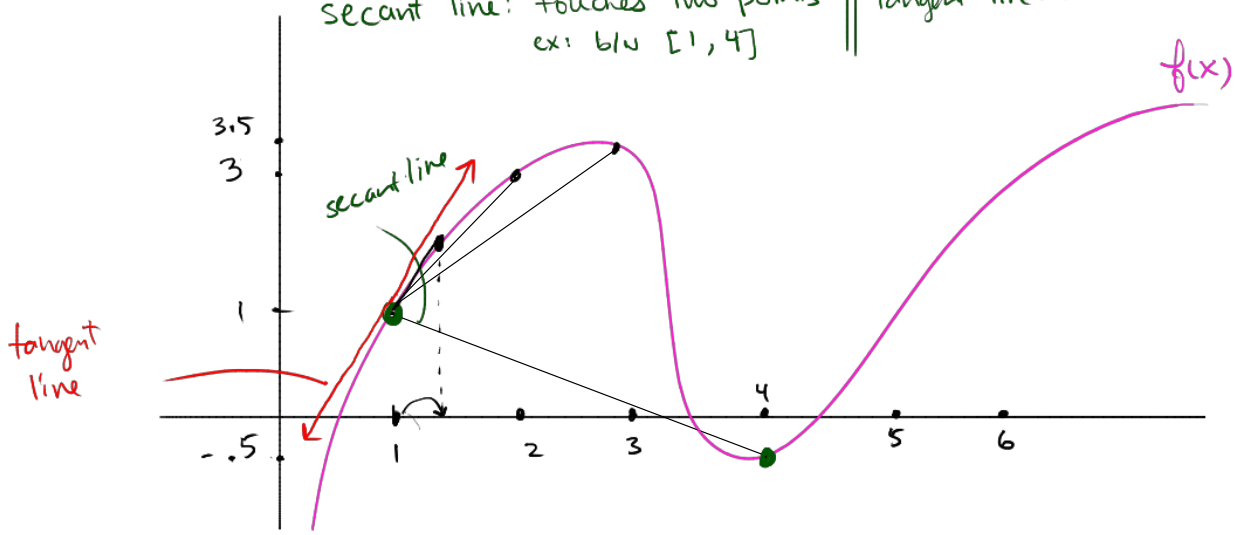


these slopes have a limit!

(this limit is the instantaneous velocity

Slopes of Secant Lines & Slope of tangent line

secant line: touches two points ex: b/w [1, 4] || tangent line: touches exactly once



Techniques for Finding Limits

① $\lim_{x \to 4} \frac{2}{(x-4)^3}$ DNE

$\underbrace{\lim_{x \to 4^-} \frac{2}{(x-4)^3}}_{\text{use table w/ } x = 3.9, 3.99, \ldots} = -\infty$ $\quad \lim_{x \to 4^+} \frac{2}{(x-4)^3} = +\infty$

$f(x) = \frac{2}{(-\frac{1}{10})^3} = \frac{-2}{(1/10)^3} = -2000$, $\quad \frac{2}{(3.99-4)^3} = \frac{2}{(-1/100)^3} = -2000000$

#18 $\lim_{x \to 5} \frac{\sqrt{x+11} - 4}{x^2 - 25} = \frac{0}{0}$ (keep going)

$$\lim_{x \to 5} \frac{\sqrt{x+11} - 4}{x^2 - 25} \cdot \left(\frac{\sqrt{x+11} + 4}{\sqrt{x+11} + 4} \right) = \lim_{x \to 5} \frac{x + 11 - 16}{(x^2-25)(\sqrt{x+11} + 4)} = \lim_{x \to 5} \frac{\cancel{x-5}}{\underbrace{(x^2-25)}_{(x-5)(x+5)}(\sqrt{x+11} + 4)}$$

$$\lim_{x \to 5} \frac{1}{(x+5)(\sqrt{x+11} + 4)} = \frac{1}{10(8)} = \frac{1}{80}$$

EX. $\lim_{x \to 0^+} \sin\left(\frac{\pi}{x}\right)$

what is $\lim_{x \to 0^+} \frac{\pi}{x} = +\infty$