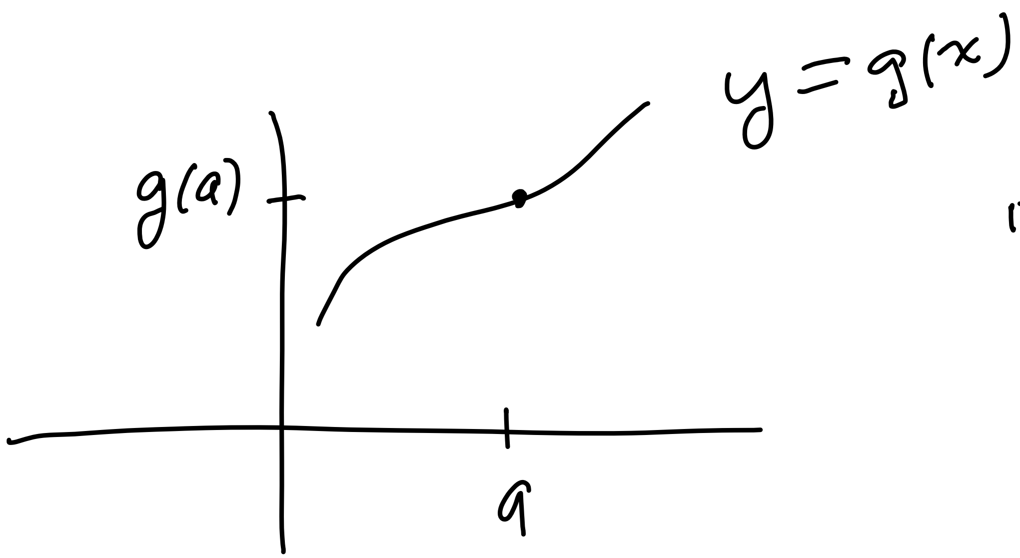
MATH 124 #2 9/30/16

READING. QUESTIONS?

$$\boxed{\lim_{x \to a} g(x) = L \quad \text{MEANS: AS } x \text{ APPROACHES } a \ (x \neq a) \text{ THE VALUES } g(x) \text{ APPROACHES } L}$$

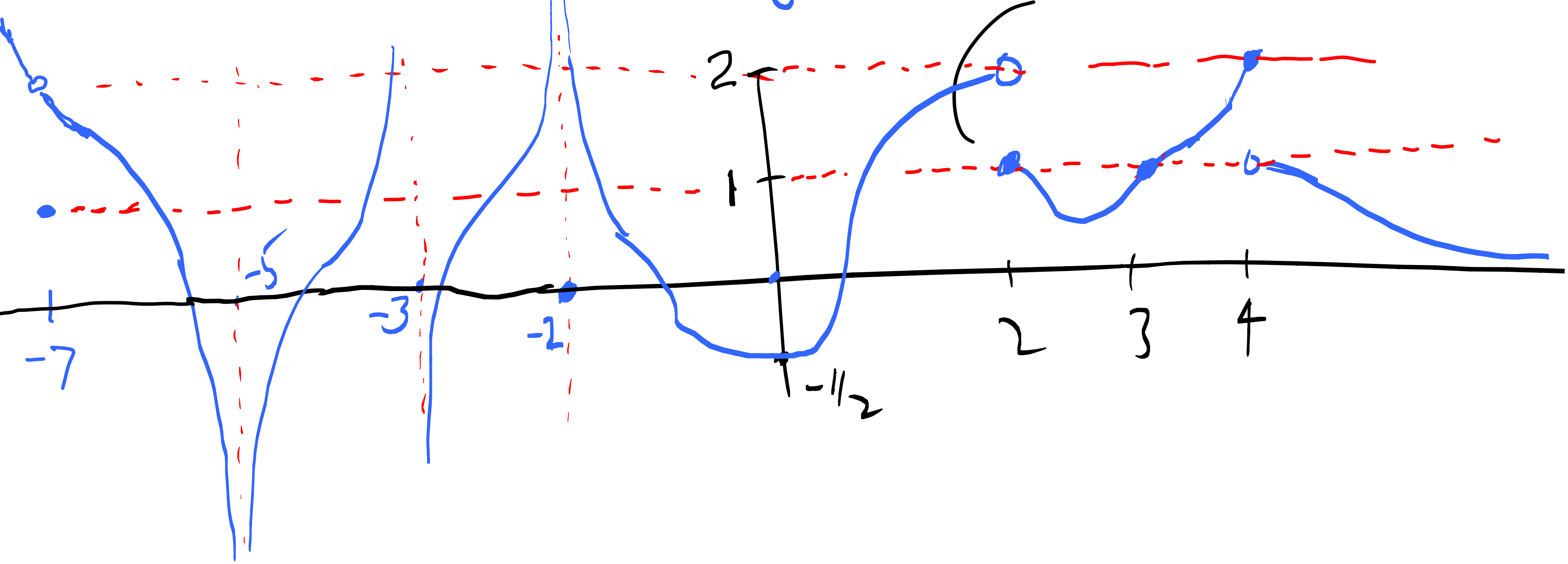
"limit"



"NICE" g HAS

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

FROM THE GRAPH:



$\lim_{x\to 3} f(x) = 1$

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

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

$f(-7) = 1$

$\lim_{x\to 0} f(x) = -1/2$

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

$\lim_{x\to -3} f(x) =$ DNE.

$\lim_{x\to -7} f(x) = 2$

$\lim_{x\to -5} f(x) = -\infty$

$\lim_{x\to \infty} f(x) = 0$

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

$f(-2) = 0$

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

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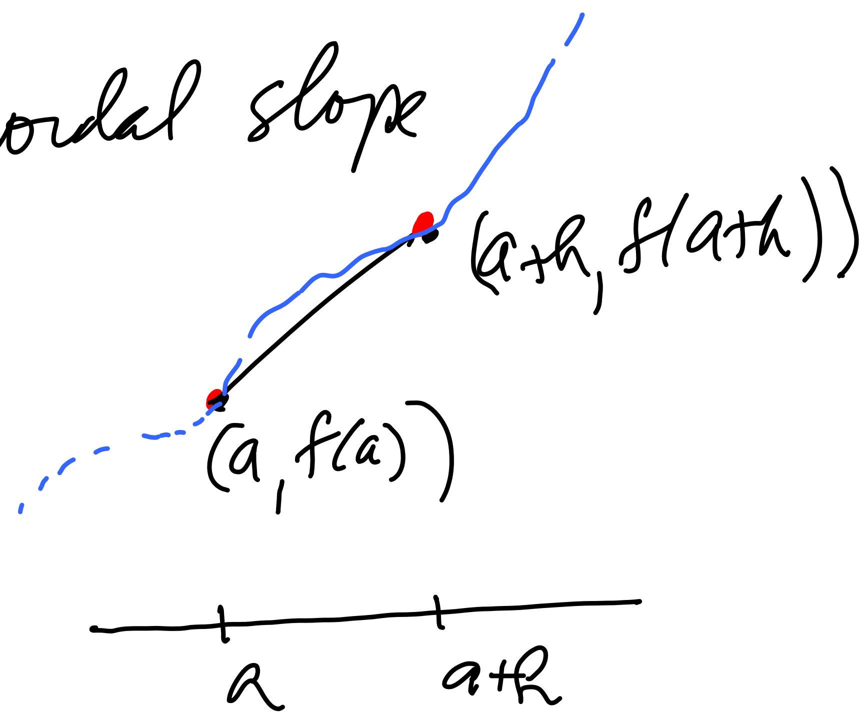
Chordal slope



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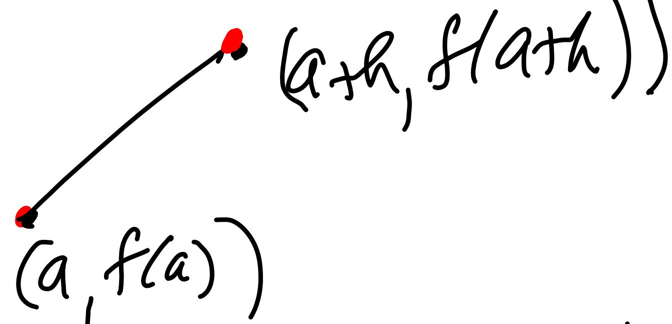
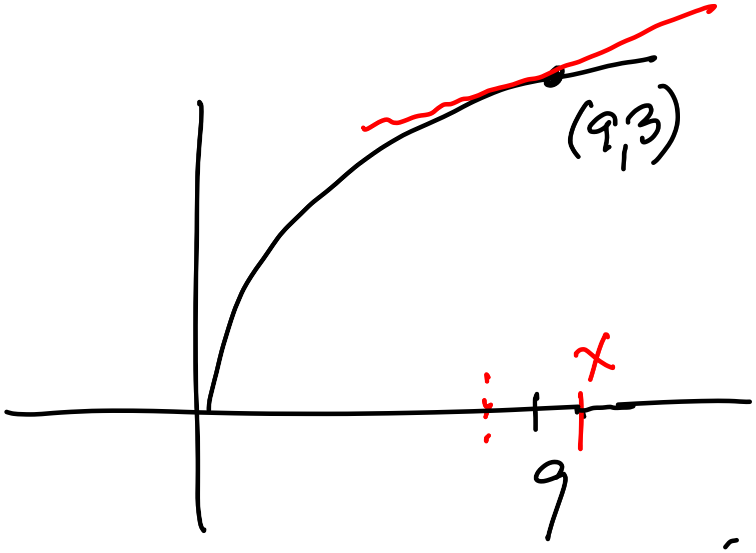
Chordal slope $= \dfrac{f(a+h)-f(a)}{a+h-a}$



$= \dfrac{f(a+h)-f(a)}{h}$

Not defined at $h=0$ but for "nice" f we can find $\lim_{h \to 0} \dfrac{f(a+h)-f(a)}{h}$



$y = \sqrt{x}$

Find eq. of tangent line when $x = 9$

Slope at $x = 9$ is $\displaystyle\lim_{x \to 9} \frac{\sqrt{x} - 3}{x - 9}$

$x \neq 9$

$$\frac{\sqrt{x} - 3}{x - 9} \cdot \frac{\sqrt{x} + 3}{\sqrt{x} + 3} = \frac{x - 9}{(x - 9)(\sqrt{x} + 3)} = \frac{1}{\sqrt{x} + 3}$$

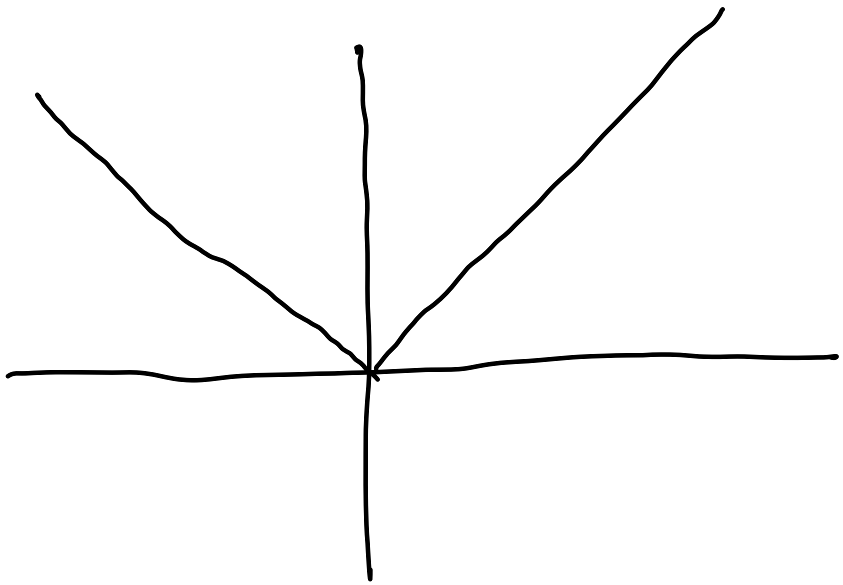
$$\longrightarrow \frac{1}{6} \text{ as } x \to 9.$$

$$y = \frac{1}{6}(x - 9) + 3$$

TANGENT LINE at $x = 9$

Graph $y=|x|$

$$|x| = \begin{cases} x & \text{if } x \geq 0 \\ -x & \text{if } x < 0 \end{cases}$$

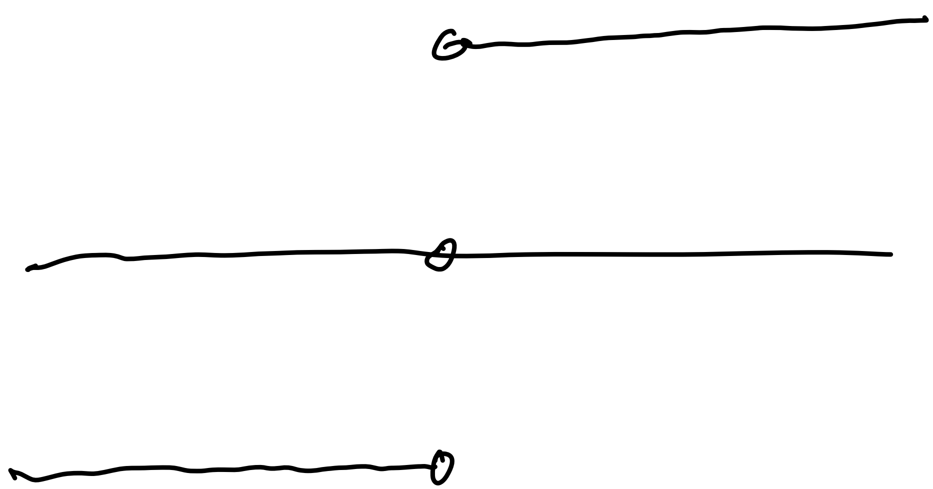


$$\frac{y(x)-y(0)}{x-0} = \frac{|x|}{x}$$

$$\lim_{x \to 0} \frac{|x|}{x} = \text{DNE}.$$

Find slope at $x=0$.

SLOPE



1

-1.

$$\lim_{x \to 9} \frac{x-9}{\sqrt{x}-3}$$

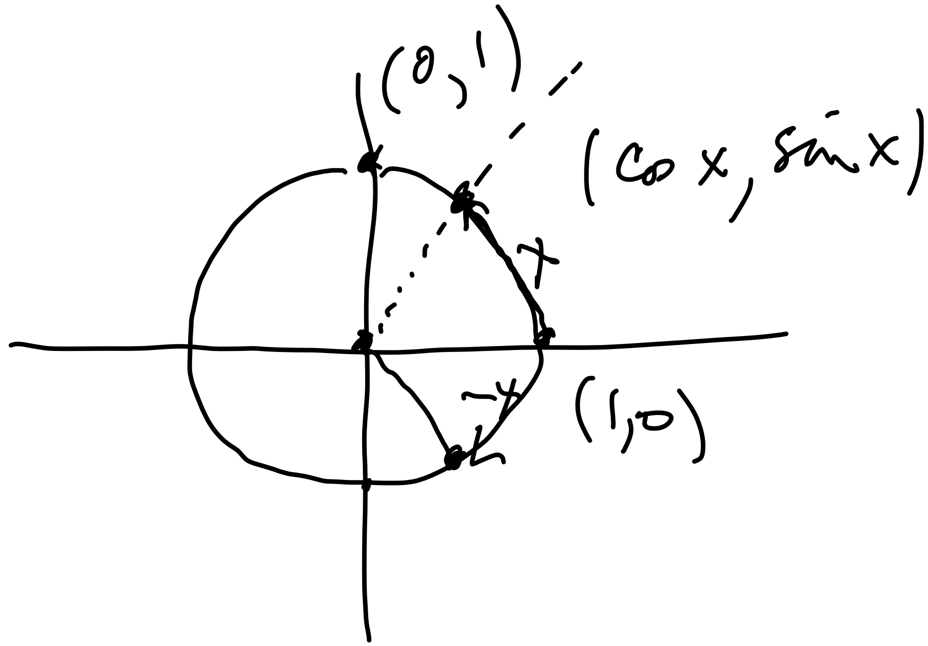
$$\frac{x-9}{\sqrt{x}-3} \cdot \frac{\sqrt{x}+3}{\sqrt{x}+3} = \frac{\cancel{(x-9)}(\sqrt{x}+3)}{\cancel{x-9}} = \sqrt{x}+3$$

$x \neq 9$

as $x \to 9$

6

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



$$\sin\left(-\pi/2\right) = -1$$

$$\cos\left(-\pi/2\right) = 0$$

$$|\sin x| \le 1$$