September 8, 2025
National Ampersand Day

Today in History:

Ford pardons Nixon (1974)

Oprah goes national (1986)

Number of the Day: 1590

1590 = 2 x 3 x 5 x 53

1590 is a number *n* such that 2*n* + 1, 4*n* + 1, and 8*n*+ 1 are all primes.

Fun Fact:

"Oreo's" are the world's best-selling brand of cookies (6 billion sold each year).

Quote of the Day:

"Life is like an ice-cream cone, you have to lick it one day at a time."

- Charles M. Schulz

Today's Weather:

Sun and clouds mixed, high near 68°

Math 121

Quiz #7

Find

$$\lim_{x\to 8} \frac{x-8}{\sqrt{x-4}-2}\left(\frac{\sqrt{x-4}+2}{\sqrt{x-4}+2}\right)$$

$$= \lim_{x\to 8} \frac{(x-8)(\sqrt{x-4}+2)}{x-4-4}$$

$$= \lim_{x\to 8} \frac{\cancel{(x-8)}(\sqrt{x-4}+2)}{\cancel{(x-8)}} = 4$$

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31 $\lim_{t\to 2} \frac{2^{2t}+2^t-20}{2^t-4}$ $\qquad x = 2^t$

$$\lim_{t\to 2} \frac{x^2+x-20}{x-4} = \lim_{t\to 2} \frac{\cancel{(x-4)}(x+5)}{\cancel{(x-4)}}$$

$$= \lim_{t\to 2} 2^t+5 = 9$$

(21) $$\lim_{h \to 0} \frac{\sqrt{2+h} - 2}{h} = \text{D.N.E.}$$

MPOD 7 #7
$$\lim_{x \to 1} \left(\frac{1}{x-1} - \frac{2}{x^2-1} \right)$$

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

$$= \lim_{x \to 1} \left(\frac{x+1}{x^2-1} - \frac{2}{(x^2-1)} \right) = \lim_{x \to 1} \frac{\cancel{x-1}}{\cancel{(x-1)}(x+1)}$$

$$= \frac{1}{2}$$

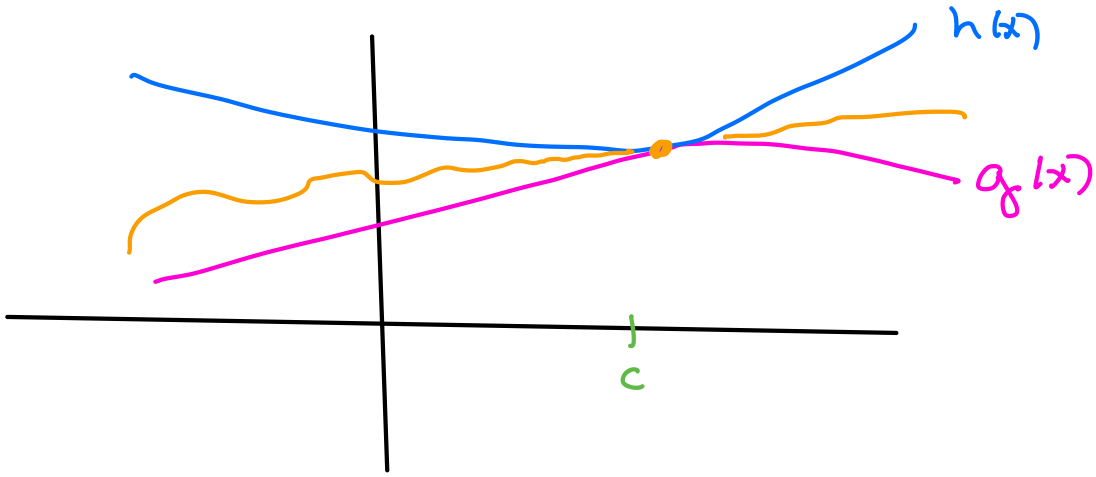
TRIG LIMITS

SQUEEZE THM / SANDWICH THM / POLICE THM

IF
$$g(x) \le f(x) \le h(x)$$

$$\lim_{x \to c} g(x) = L \qquad \lim_{x \to c} h(x) = L$$

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

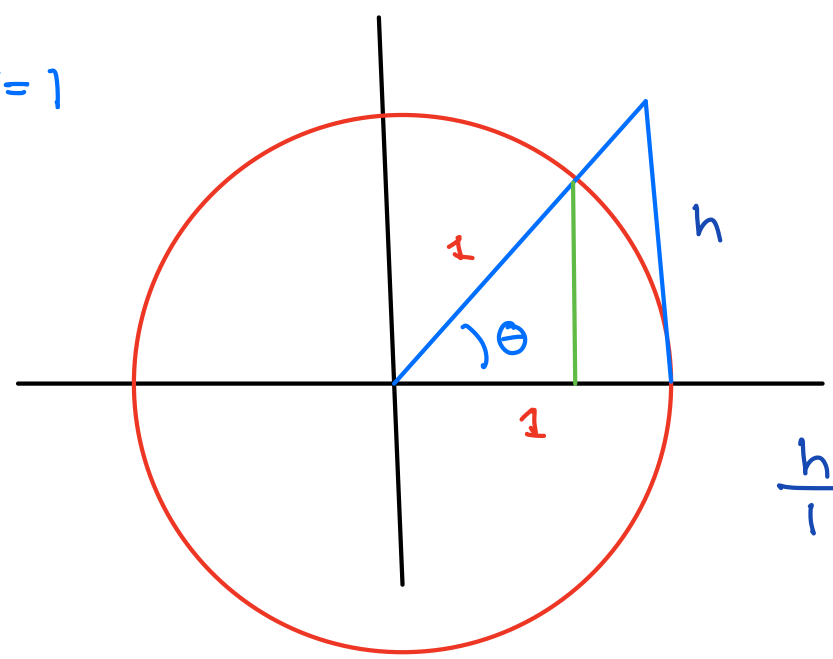


$$\lim_{x \to 0} x \sin\left(\frac{1}{x}\right) = 0$$

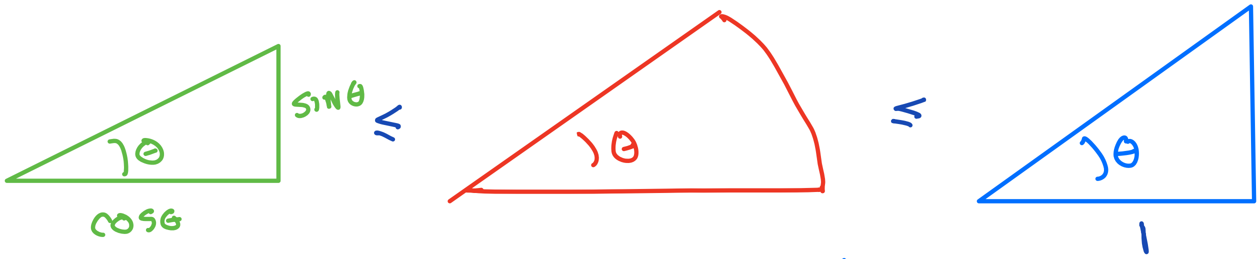
$$x\left(-1 \le \sin\left(\frac{1}{x}\right) \le 1\right)$$

$$\underbrace{-x}_{\to\, 0} \le x \sin\left(\frac{1}{x}\right) \le \underbrace{x}_{\to\, 0}$$

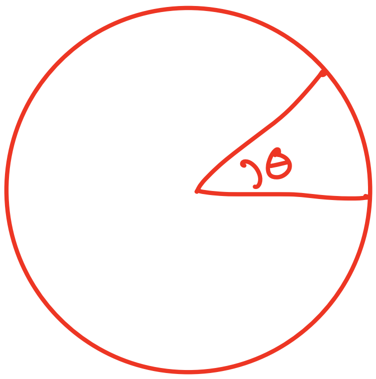
$x^2 + y^2 = 1$



$$\frac{h}{1} = \tan\theta$$



$$\frac{1}{2}\cos\theta\sin\theta \leq \frac{\theta}{2} \leq \frac{1}{2}(1)\tan\theta$$



$$\frac{A}{\theta} = \frac{\text{AREA CIRCLE}}{2\pi}$$

$$\frac{A}{\theta} = \frac{\cancel{\pi}(1)^2}{2\cancel{\pi}}$$

$$A = \frac{1}{2}\theta$$

$$\frac{1}{\cancel{2}}\cos\theta\sin\theta \leq \frac{\theta}{\cancel{2}} \leq \frac{\tan\theta}{\cancel{2}}$$

$$\frac{\cos\theta\,\cancel{\sin\theta}}{\cancel{\sin\theta}} \leq \frac{\theta}{\sin\theta} \leq \frac{\;\frac{\cancel{\sin\theta}}{\cos\theta}\;}{\cancel{\sin\theta}}$$

$$\cos\theta \leq \frac{\theta}{\sin\theta} \leq \frac{1}{\cos\theta}$$

$$\frac{1}{\cos\theta} \geq \frac{\sin\theta}{\theta} \geq \cos\theta$$

$$\underset{\searrow\; 1}{\cos\theta} \leq \frac{\sin\theta}{\theta} \leq \underset{\swarrow\; 1}{\frac{1}{\cos\theta}}$$

$$\boxed{\lim_{\theta \to 0} \frac{\sin\theta}{\theta} = 1}$$

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

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

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

$$\lim_{\square \to 0} \frac{\sin(\square)}{\square} = 1$$

EXAMPLE

① $$\lim_{x \to 0} 3\left[\frac{\sin(3x)}{3x}\right] = 3$$

② $$\lim_{x \to 0} \frac{1-\cos x}{x}\left(\frac{1+\cos x}{1+\cos x}\right)$$

$$= \lim_{x \to 0} \frac{1-\cos^2 x}{x(1+\cos x)} = \lim_{x \to 0} \frac{\sin^2 x}{x(1+\cos x)}$$

$$= \lim_{x\to 0} \underbrace{\frac{\sin x}{x}}_{1} \underbrace{\frac{\sin x}{1}}_{0} \cdot \underbrace{\frac{1}{1+\cos x}}_{\frac{1}{2}} = 0$$

③ $$\lim_{x\to 0} \frac{\sin(2x)\sin(3x)}{x^2}$$

$$= \lim_{x\to 0} 2\left(\frac{\sin(2x)}{2x}\right) \cdot 3\left(\frac{\sin(3x)}{3x}\right) = 2 \cdot 3 = 6$$

④ $$\lim_{x\to 0} \frac{x}{\tan(5x)} = \lim_{x\to 0} \frac{x}{\frac{\sin(5x)}{\cos(5x)}}$$

$$= \lim_{x\to 0} \frac{1}{5}\left(\frac{5x}{\sin(5x)}\right) \frac{\cos(5x)}{1} = \frac{1}{5}$$

TWO LIMITS YOU NEED TO KNOW:

$$\boxed{\lim_{x\to 0} \frac{\sin x}{x} = 1} \qquad \boxed{\lim_{x\to 0} \frac{1-\cos x}{x} = 0}$$