Good afternoon: warm up in notebooks

Find each limit. If it doesn't exist, show why.

$$f(x) = \begin{cases} 4x, & x \neq 3 \\ \cos(x), & x = 3 \end{cases}$$

$$\lim_{x\to 3} f(x) = 12$$

$$\cancel{f(3) = \cos(3)}$$

$$f(x) = \begin{cases} 4x, & x < 1 \\ x^2+3, & x > 1 \\ x+2, & x = 1 \end{cases}$$

$$\lim_{x\to 1^-} 4x = 4$$

$$\lim_{x\to 1^+} x^2+3 = 4$$

$$\lim_{x\to 1} f(x) = 4$$

Reminders:
assessment during DS Wednesday (no calc)
tutoring tomorrow 4-5p

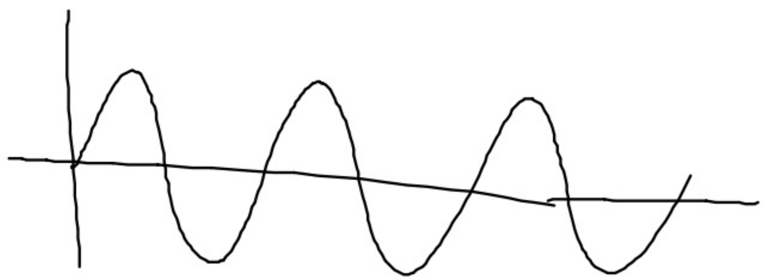
Senior lunch forms?
have out on desk,
will sign during class

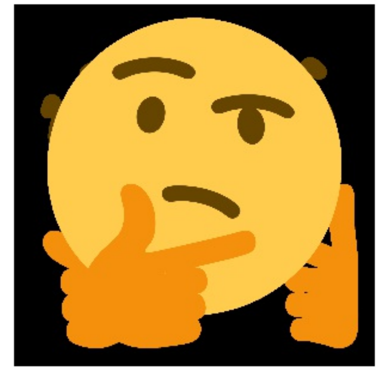
HW

Questions on practice assessment except for #2?

Notes

$$\lim_{x\to\infty} \frac{\sin(x)}{e^x} = \frac{\approx -1 \text{ to } 1}{e^{\infty}} = \frac{\text{small}}{\infty} = 0$$





The Squeeze Theorem

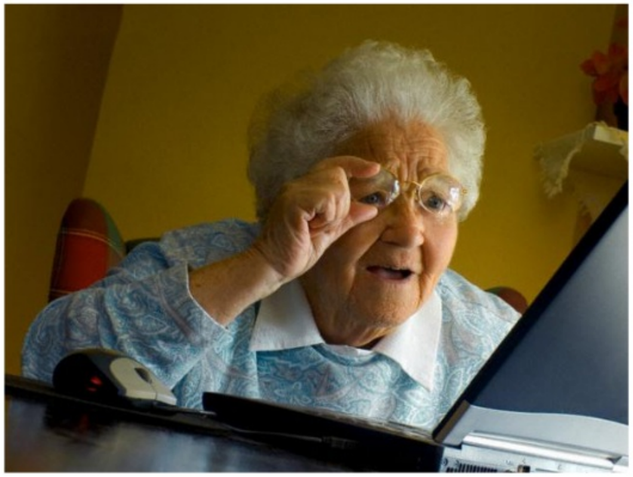
Let I be an interval having the point a as a limit point. Let f, g, and h be functions defined on I, except possibly at a itself. Suppose that for every x in I not equal to a, we have:

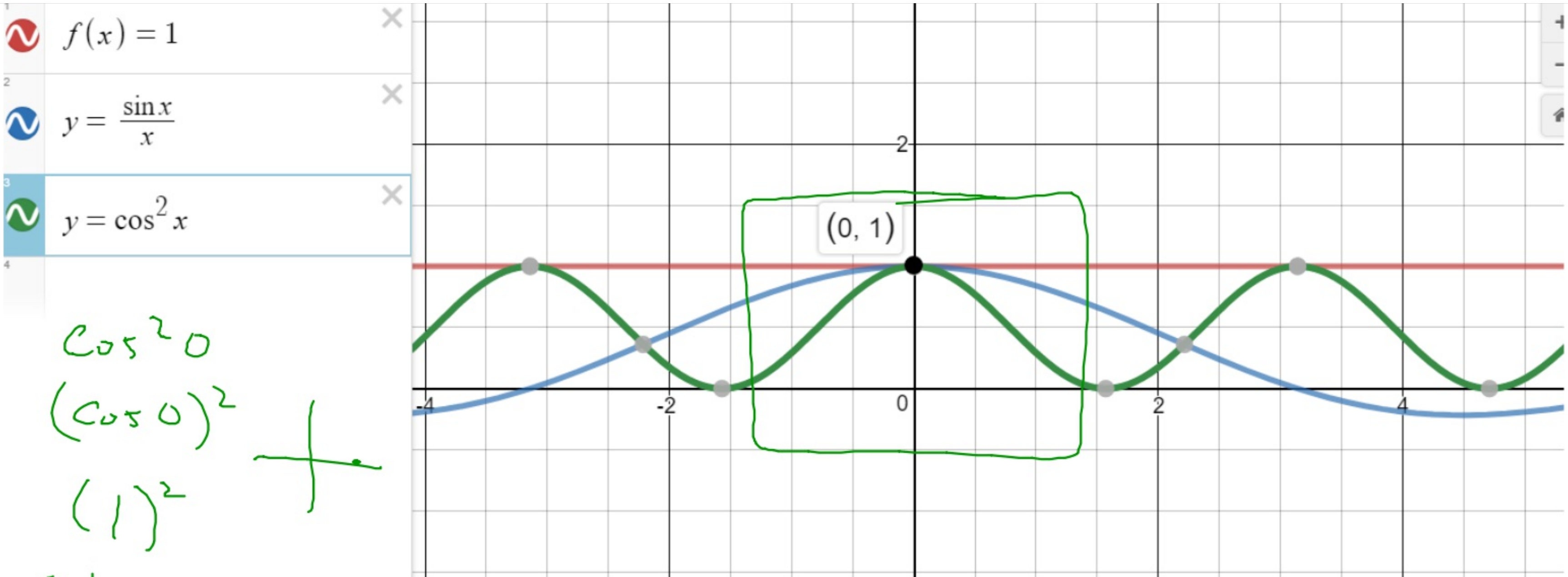
$$g(x) \leq f(x) \leq h(x)$$

and also suppose that:

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

Then $\lim_{x \to a} f(x) = L.$





$\cos^2 0$

$(\cos 0)^2$

$(1)^2$

$= 1$

Over (-2,2) except for x=0: $\cos^2(x) \le \frac{\sin(x)}{x} \le 1$

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

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

$$= 1$$

[redacted]

Special Trig Limits (must memorize these)

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

$$\lim_{x \to 0} \frac{1 - \cos(x)}{x} = 0$$

(both are provable by the squeeze theorem) ex $\displaystyle\lim_{x\to 0} \frac{\sin(3x)}{x} \cdot \frac{3}{3}$

$\sin(3x) \neq 3\sin(x)$

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

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

$x = \frac{z}{3}$

$x \to 0 \quad \frac{z}{3} \to 0$

Let

$z = 3x$

As $z \to 0$

$3x \to 0$

$$3 \cdot \lim_{z\to 0} \frac{\sin(z)}{z}$$

$$3 \cdot 1 = 3$$

Absolute Value Limits

Abs. Values
are
Piecewise
in disguise!!!!

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

① Set absolute value part = 0.

② Solve. This is the "handoff."

③ Write a piecewise w/ handoff pt.

$$x-1=0$$
$$+1 \quad +1$$
$$x=1$$

$$\begin{cases} \dfrac{x^2-1}{x-1}, & x>1 \\ \dfrac{x^2-1}{-(x-1)}, & x<1 \end{cases}$$

to be continued

HW: worksheet #1-18 (numerical answers at mcalc.weebly.com)
study for non-calculator assessment (DS on Weds)

notes + videos website,tutoring tomorrow for help :)