Exam 1 FRQ <u>Musts</u>

1) Write Squeeze Theorem / IVT
2) Write $\lim\limits_{x \to \ldots}$ at every necessary step
   - stop after the limit is evaluated
3) If using IVT, explain why the function is continuous

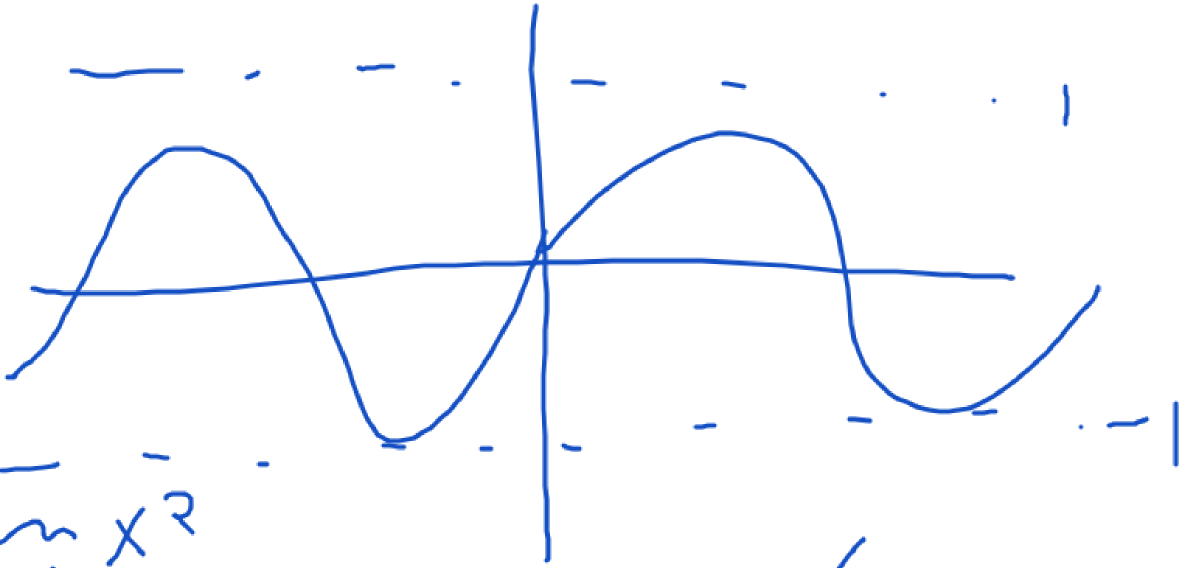
$$\lim_{x \to 0} x^2 \sin\left(\frac{1}{x}\right)$$

$$-1 \le \sin(x) \le 1$$

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

$$-x^2 \le x^2 \sin\left(\frac{1}{x}\right) \le x^2$$

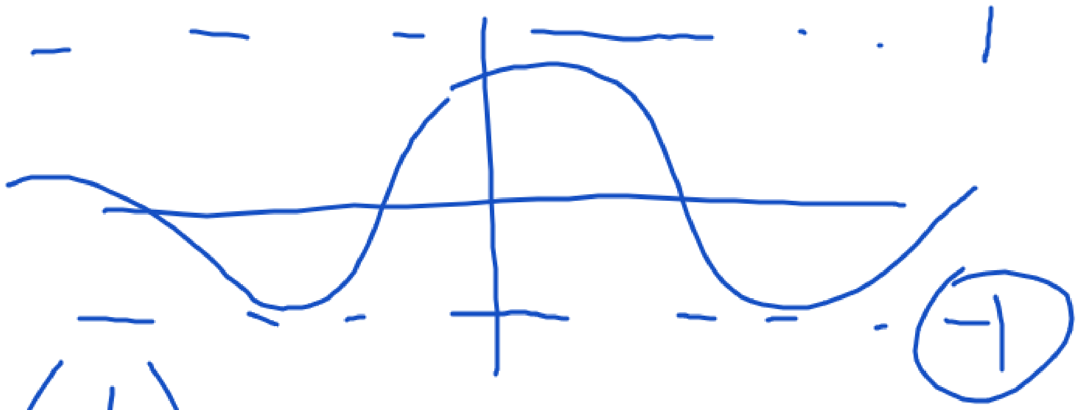
$$\lim_{x \to 0} -x^2 \le \lim_{x \to 0} x^2 \sin\left(\frac{1}{x}\right) \le \lim_{x \to 0} x^2$$



$$\boxed{0 \le g(x) \le 0}$$

By the Squeeze Thm ✓

$$\underbrace{\lim_{x\to\infty}}\ \frac{2-\cos(x)}{\underbrace{x+3}}$$



$$\to \left(-1 \le \cos(x) \le 1\right)(-1)$$

$$\left(1 \ge -\cos(x) \ge -1\right) + 2$$

$$\frac{3}{x+3} \ge \frac{2-\cos(x)}{x+3} \ge \frac{1}{x+3}$$

$$\lim_{x\to\infty} \frac{1}{x+3}$$

$$100000 \qquad \frac{1}{100003}$$

$$\underbrace{\lim_{x\to\infty}\frac{3}{x+3}}_{0} \ge \underbrace{\lim_{x\to\infty}\frac{2-\cos(x)}{x+3}}_{g(x)} \ge \underbrace{\lim_{x\to\infty}\frac{1}{x+3}}_{0} \leftarrow \text{by the Sq. Th.}$$

$$\lim_{x \to -2} \frac{-6|x|+12}{3x+6}$$

$$\begin{cases} \lim_{x \to -2} \dfrac{-6(x)+12}{3x+6} & 0 < x \leftarrow \\ \underline{\lim_{x \to -2}} \left. \dfrac{6x+12}{3x+6} \right\} = 2 & x < 0 \end{cases}$$

$$\lim_{x \to -2} 2 = 2$$

$$g(x) = x^2 + \frac{e^x}{x^2-1}$$

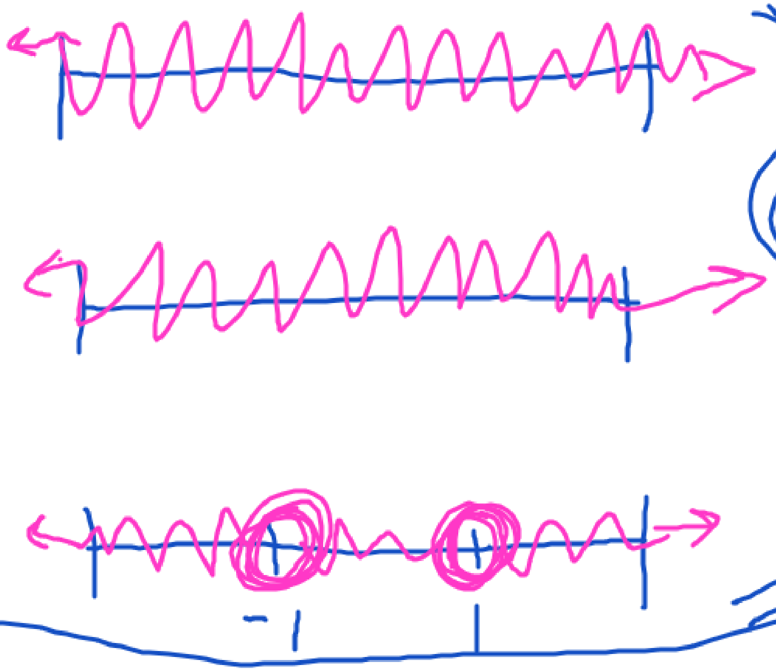
find int. where $g(x)$ is cont.

$$x^2 \rightarrow (-\infty, \infty)$$

$$e^x \rightarrow (-\infty, \infty)$$

$$\frac{1}{x^2-1} \rightarrow x \neq 1$$

$$x \neq -1$$



$$\boxed{(-\infty, -1) \cup (-1, 1) \cup (1, \infty)}$$

$$g(x) = \underbrace{\ln(x)}_{(0,\infty)} + \frac{1}{x-2}$$

$x \neq 2 \rightarrow (0,2) \cup (2,\infty)$

$$f(x) = \frac{x^2-3x-5}{3x}$$ has a zero on $[-2,-1]$

continuous

$$\left.\begin{aligned} f(-2) &= -\frac{5}{6} \\ f(-1) &= \frac{1}{3} \end{aligned}\right\} -\frac{5}{6} \leq 0 \leq \frac{1}{3}$$