# Warmup

Using IVT Determine if there are any roots for the function $F(x) = x^2 + 3x - 9$ on the interval [1, 2]

# Limits Involving Trig Functions

Unit 1 day 5

# What are our choices?

**If the function is defined at c…**

(#1) then calculate f(c) by plugging “C” directly into the function

**If the function is not defined at "c"** (has a hole/asymptote)

*Other options:*

Factor & Simplify, re-write and simplify, rationalize, use a table/graph to find values very close to "c"

Ex 1) $\lim_{x \to 0} \frac{\cos(x)}{\sin(x)-3}$

$$= \frac{\cos(0)}{\sin(0) - 3}$$

$$= \frac{1}{0 - 3}$$

$$= \mathbf{\frac{1}{-3}}$$

Ex 2) $\lim_{x \to \pi} x\cos(x)$

Ex 3) $\lim_{x \to 0^+} \cot(x)$

# Common Trig Limits to memorize

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

1

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

0

Ex 4) $\lim_{x \to 0} \frac{\sin(4x)}{x}$

$$\lim_{x \to 0} \frac{\sin(4x)}{x} \frac{\cdot 4}{\cdot 4}$$

$$\lim_{x \to 0} \frac{\mathbf{4}\sin(4x)}{\mathbf{4}x}$$

$$\mathbf{4} \lim_{x \to 0} \frac{\sin(4x)}{4x}$$

$$4 \cdot 1 = \mathbf{4}$$

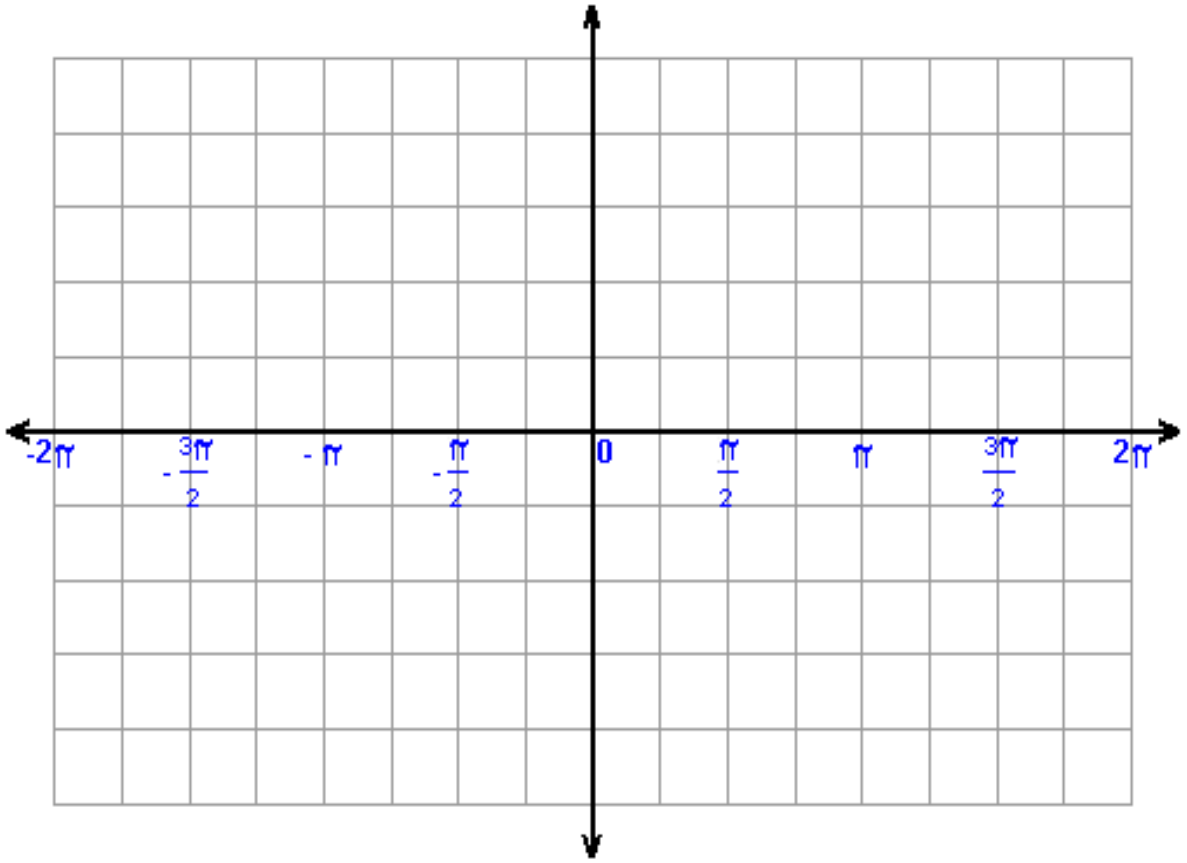
Ex 5) $\lim_{x \to 0} \frac{\tan(x)}{x}$

Ex 6) $\lim_{x \to 0} \frac{\sec(x) - 1}{x}$

Ex 7) $\lim_{x \to 0} \frac{\sin(x)(1-\cos(x))}{2x^2}$

# Class assignment

(a) Graph the piecewise function: $f(x) = \begin{cases} sinx, & -2\pi \leq x < 0 \\ cosx, & 0 \leq x \leq 2\pi \end{cases}$




(b) There are 3 locations where the limit of f(c) DNE, where are they?

(c) Use interval notation to explain where the limit DOES exist

2. Show that $\lim_{x \to 0} \frac{x + \sin(x)}{x} = 2$

3. Evaluate: $\lim_{x\to\infty} \frac{\cos\left(\frac{1}{x}\right)}{1+\frac{1}{x}}$ by finding the limit of the numerator and denominator separately