2.3 Trigonometric Limits

Wednesday, June 12, 2019 7:14 AM

$\lim_{x\to 0} \sin x = 0$ $\quad \lim_{x\to 0} \cos x = 1$ $\quad \lim_{x\to 0} \tan x = 0$

$\lim_{x\to 0} \frac{\sin 5x}{2x} = \frac{5}{2}$ $\quad \lim_{x\to 0} \frac{4x}{\tan 3x} = \frac{4}{3}$ $\quad \lim_{x\to 0} \frac{\sin 6x}{\sin 7x} = \frac{6}{7}$

Rules for sin and tan (not cos)

$\lim_{x\to 0} \frac{\sin Ax}{Bx} = \frac{A}{B}$ $\quad \lim_{x\to 0} \frac{Ax}{\sin Bx} = \frac{A}{B}$ $\quad \lim_{x\to 0} \frac{\sin Ax}{\sin Bx} = \frac{A}{B}$

ex

$\lim_{x\to 0} \frac{\sin 3x}{6} = \frac{0}{6} = 0$

$\lim_{x\to 0} \frac{\tan 4x}{2x} = \frac{4}{2} = 2$

$\lim_{x\to 0} \frac{10x}{\cos 5x} = \frac{0}{1} = 0$

$\lim_{x\to \pi} \frac{\sin x}{2x} = \frac{0}{2\pi} = 0$

$\lim_{x\to 0} \frac{8}{\cos 2x} = \frac{8}{1} = 8$

$\lim_{x\to 0} \frac{8x^2}{\sin 4x} = 0$

$\lim_{x\to 0} \frac{8x}{\sin 4x} \cdot \frac{x}{1}$

$\frac{8}{4} \cdot \frac{0}{1} = 0$

Factoring:

$\lim_{x\to 0} \frac{\sin 8x}{6x^2 + 4x} \rightarrow \frac{\sin 8x}{2x(3x+2)}$

$\lim_{x\to 0} \frac{\sin 8x}{2x} \cdot \frac{1}{(3x+2)}$

TRIG RULE ↓ SUBST. ↓

$\frac{8}{2} \cdot \frac{1}{2}$

$\frac{8}{4} \rightarrow \boxed{2}$

① Subst. $\frac{0}{0}$ ≈

② F/C ≈

③ Conj ≈

④ Trig Limit

⑤ Type 2 Infinite Limit

④ Trig Limit
⑤ Type 2 Infinite Limit

Separate Into Fractions:

$$\lim_{x\to 0} \frac{2x^2 + 8x - \sin 4x}{2x}$$

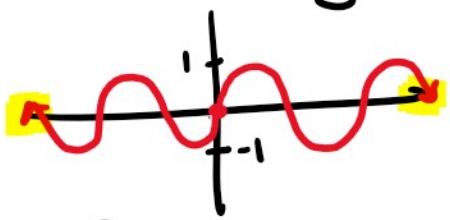
$$\lim_{x\to 0} \left(\frac{2x^2}{2x} + \frac{8x}{2x} - \frac{\sin 4x}{2x} \right)$$

$$\lim_{x\to 0} \left(x + 4 - \frac{\sin 4x}{2x} \right)$$

$$0 + 4 - \frac{4}{2}$$

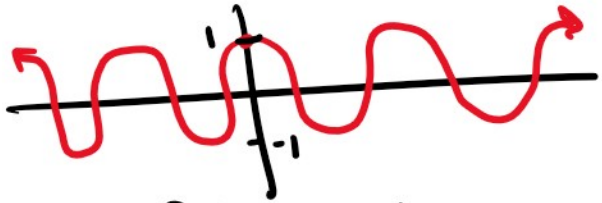
$$\boxed{2}$$

Infinite Trig. Limits:



$f(x) = \sin x$

$\lim_{x\to\pm\infty} \sin x =$ between $[-1, 1]$



$f(x) = \cos x$

$\lim_{x\to\pm\infty} \cos x =$ between $[-1, 1]$

ex $\lim_{x\to\infty} \frac{\sin 6x}{2x} = \frac{[-1,1]}{\text{HUGE}} = 0$ (small)

$$\lim \frac{5x^2 - 2x + \sin x}{} = \frac{5}{} = 5$$

(2 over $5x^2$; $[-1,1]$ over $\sin x$)

$$\lim_{x \to \infty} \frac{5x^{2} - 2x + \sin x}{x^{2} - \cos x} = \frac{5}{1} = 5$$

$[-1, 1]$