$$\lim_{x\to 1} \frac{2x^2-3x-5}{x+1} = \frac{-6}{2} = -3$$

$$\lim_{x\to\infty} \frac{1}{\sqrt{x+5}} = \frac{1}{\sqrt{\infty}} = \frac{1}{\infty} = 0$$

$$\lim_{x\to\infty} 1-x = -\infty$$

$$\lim_{x\to\infty} x^2-2x-3 = +\infty$$

$$= \frac{1}{\infty} = 0$$

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

$$\lim_{x\to\infty} \left(\frac{2}{3}\right)^x = \lim_{x\to\infty} \frac{2^x}{3^x} = 0$$

$$= \frac{\infty}{1} = \infty$$

$$\lim_{x\to\infty} \frac{1}{x-5} = 0$$

$$\lim_{x\to\infty} \left(\frac{3}{2}\right)^x = \frac{3^x}{2^x} = +\infty$$

Свойства перделов:

1. предел от константы = константе $\lim\limits_{x\to a} c = c$

2. перел суммы(разности) равен сумме пределов $\lim\limits_{x\to a}(f(x)+g(x)) = \lim\limits_{x\to a}(f(x)) + \lim\limits_{x\to a}(g(x))$

3. предел произведения функции на постоянную величину равен произведению постоянной величинына функци.

$$\lim_{x\to a} k\cdot f(x) = k\cdot\lim_{x\to a} f(x)$$

4. lim f(x)*g(x), x-> inf = $\lim\limits_{x\to a} f(x)g(x) = \lim\limits_{x\to a} f(x)\cdot\lim\limits_{x\to a} g(x)$

$$\lim_{x\to a}\frac{f(x)}{g(x)} = \frac{\lim\limits_{x\to a} f(x)}{\lim\limits_{x\to a} g(x)}$$

линейность предела:
1. констаната выносим за lim
2. предел суммы = сумме пределов

Раскрытие неопределенности:

$\left[\frac{0}{0}\right]; \left[\frac{\infty}{\infty}\right]$

$$\lim_{x\to\infty} \frac{\infty^2}{\infty^3} = \frac{1}{x} = 0$$

$$\lim_{x\to\infty} \frac{\infty^4}{\infty^2} = \infty$$

$$\lim_{x\to\infty} \frac{3\infty^3}{5\infty^3} = \frac{3}{5}$$

$$\lim_{x\to\infty} \frac{\infty}{\infty}$$

раскрываем неопределеность вида ... посредствам

делим числитель и знаменатель на x в старшей степени

$$\lim_{x \to \infty} \frac{2x^2 - 3x - 5}{1 + x + 3x^2} = \frac{\infty}{\infty} \to \frac{2}{3}$$

$$\lim_{x \to \infty} \frac{\frac{2x^2 - 3x - 5}{x^2}}{\frac{1 + x + 3x^2}{x^2}} \;:x^2 = \frac{2 - \frac{3}{x}^{\to 0} - \frac{5}{x^2}^{\to 0}}{\underset{\to 0}{\frac{1}{x^2}} + \underset{\to 0}{\frac{1}{x}} + 3} \to \frac{2}{3}$$

$$\lim_{n\to\infty}\frac{n\sqrt[3]{7n}-\sqrt[4]{81n^8-1}}{(n+4\sqrt{n})(\sqrt{n^2-5})}=\frac{\infty-\infty}{\infty}$$

$$\frac{\dfrac{n\sqrt[3]{7n}-\sqrt[4]{81n^8-1}}{n^2}}{\dfrac{(n+4\sqrt{n})(\sqrt{n^2-5})}{n^2}}=$$

$$=\frac{\sqrt[3]{\dfrac{7}{n^2}}-\sqrt[4]{\dfrac{81n^8}{n^8}-\dfrac{1}{n^8}}}{\dfrac{(n+4\sqrt{n})}{n}\cdot\dfrac{(\sqrt{n^2-5})}{n}}=-\sqrt[4]{3^4}=-3$$

$$\frac{(n+4\sqrt{n})}{n}\cdot\frac{(\sqrt{n^2-5})}{n}=\left(1+\frac{4}{\sqrt{n}}\right)\left(\sqrt{\frac{n^2-5}{n^2}}\right)=\left(\sqrt{1-\frac{5}{n^2}}\right)$$

первый замечательный предел:

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

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

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

$$\lim_{x\to 0}\frac{\frac{5x}{3}}{\sin\frac{5x}{3}}$$

$$\lim_{x\to 0}\frac{x^3-5x^2+x}{\sin(x^3-5x^2+x} =$$

$$\lim_{x\to 0}\frac{\sin(x^2-3x+5)}{x^2-3x+5} \neq 1$$

$$\to 1$$

$$\lim_{x\to 0}\frac{\sin 7x}{3x} = \left[\frac{0}{0}\right] = \frac{\sin 7x}{3\cdot\frac{1}{7}\cdot 7x} =$$

$$= \frac{1}{\frac{3}{7}} = \frac{7}{3}$$

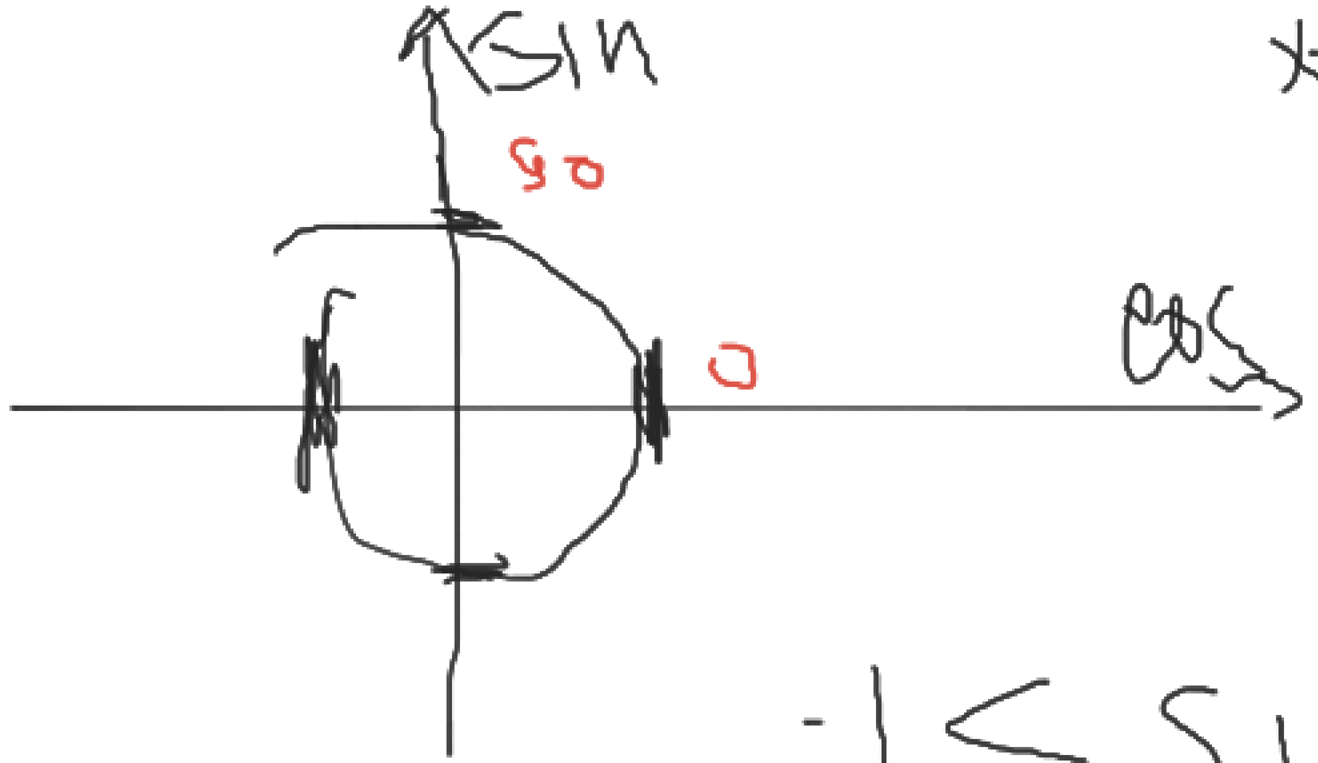
$$\lim_{x\to\frac{5}{2}} \frac{2x^2-9x+10}{2x-5} = \left[\frac{0}{0}\right] = \frac{\cancel{(2x-5)}(x-2)}{\cancel{(2x-5)}} = x-2$$

$$\begin{array}{r|l} 2x^2-9x+10 & 2x-5 \\ \cline{2-2} -\;(2x^2-5x) & x-2 \\ \cline{1-1} -4x+10 & \\ -\;(-4x+10) & \\ \cline{1-1} 0 & \end{array}$$

$$= \lim_{x\to\frac{5}{2}} (x-2) = \left(\frac{5}{2}-2\right) = \frac{1}{2}$$

$$\lim_{x\to 0} \frac{5x^2}{\sin^2\frac{x}{2}} = \left[\frac{0}{0}\right] =$$

$$= \frac{5x\cdot x}{\sin\frac{x}{2}\cdot\sin\frac{x}{2}} = \frac{\frac{x}{2}\cdot\frac{x}{2}\cdot 5\cdot 2\cdot 2}{\sin\frac{x}{2}\cdot\sin\frac{x}{2}} = 20$$



$$-1 < \sin < 1$$

$=$

$$\lim_{x\to 0}\frac{tg2x}{2x^2}=\left[\frac{tg\,0}{0}\right]=\left[\frac{0}{0}\right]=\frac{\sin 2x}{\underset{1}{\cos 2x}\cdot 2x\cdot x}=\frac{1}{x}=\frac{1}{0}=\infty$$

$$\cos 2x=\cos 0=1$$

$$\lim_{x\to 0}\frac{1-\cos 4x}{5x}=\frac{1-1}{5\cdot 0}=\left[\frac{0}{0}\right]=\frac{2\sin^2 2x}{5x}=$$

$$\frac{2}{5}\lim_{x\to 0}\frac{\sin^2 2x}{x}=\frac{\sin 2x\,\sin 2x}{\frac{1}{2}\,2x}$$

$$1-\cos 2\alpha=2\sin^2\alpha$$

$$2\cdot\frac{2}{5}\lim_{x\to 0}\sin 2x=\frac{4}{5}\cdot 0=0$$

$$\lim_{x\to 0}\frac{\operatorname{arctg} 3x}{7x} = \frac{1}{7}\lim_{x\to 0} 3\cdot\frac{\operatorname{arctg}(3x)}{3x}\cdot 1 = \frac{1}{7}\cdot 3 = \frac{3}{7}$$

$$\operatorname{arctg} 3x = t$$

$$\lim_{x\to 0}\frac{t}{7x} = \lim_{t\to 0}\frac{t}{7\cdot\left(\frac{\operatorname{tg} t}{3}\right)} = \frac{1}{\frac{7}{3}} = \frac{3}{7}$$

$$\operatorname{tg}(\operatorname{arctg} 3x) = \operatorname{tg} t$$

$$3x = \operatorname{tg} t \qquad x = \frac{\operatorname{tg} t}{3}$$

$x = 4$

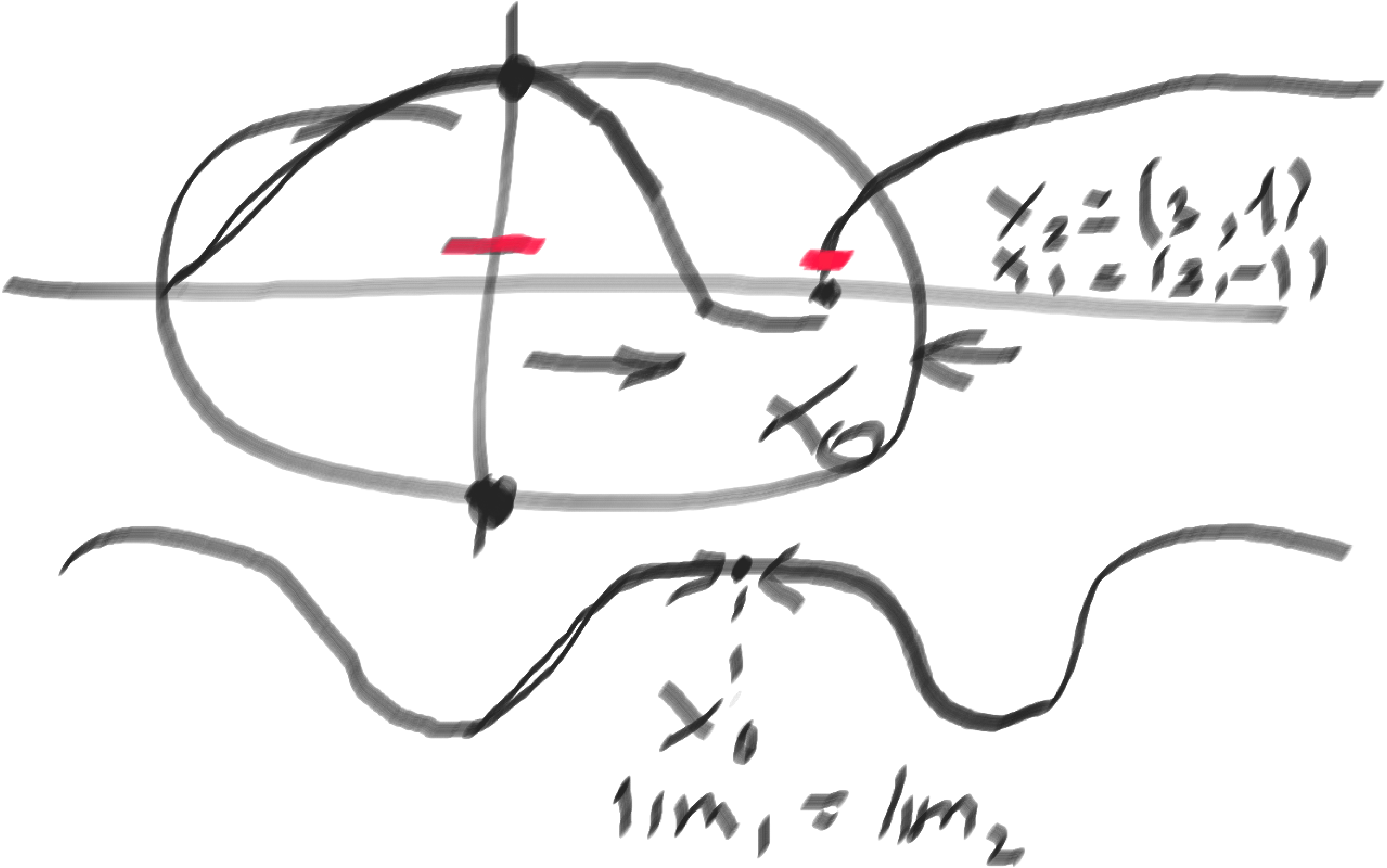
$x \to 0$

def arc...

retern ...

def tg(x)

netere int



$x_2 = (3, 1)$
$x_1 = (3, -1)$
x_0
x'_0
$\lim_1 = \lim_2$

$$\lim_{x\to\infty} \sin x = \frac{\sqrt[3]{n^2}\cdot\sin(n^2)}{n-1} = \left[\frac{\infty}{\infty}\right]$$

ограниченная функция

$$-1 \le x \le 1$$

$$= \frac{\frac{n^{\frac{2}{3}}}{n} \to 0}{\frac{n}{n} - \frac{1}{n}} = 0$$

$$1 - \frac{1}{n} \to 0$$

$$\frac{\pi}{2} = 90^\circ$$

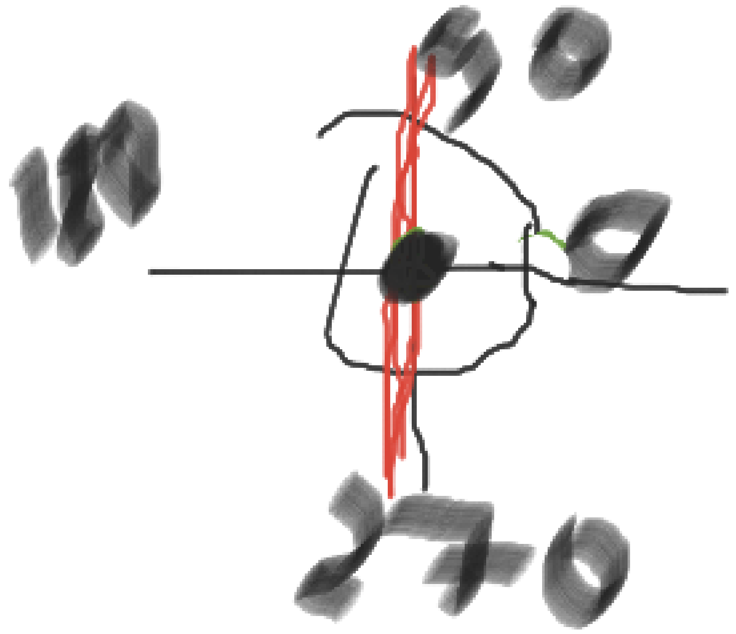
-1

$$x \to 0 \qquad \frac{1}{0} = \infty$$

$$\lim_{x\to 0}\frac{1-\cos 4x}{5x} = \frac{0}{0} = \frac{2\sin^2 2x}{5x} = \frac{2}{5}\lim \frac{\sin 2x \sin 2x}{x} =$$

$$1-\cos 2x = 2\sin^2 x \qquad = \frac{2\sin 2x \,\sin 2x}{5 \cdot 2x \cdot \frac{1}{2}} =$$

$$= \frac{4}{5}\lim_{x\to 0} \sin 2x = \frac{4}{5}\sin 2\cdot 0 = \cancel{\frac{4}{5}}\, 0$$



$$\lim_{x\to 0} \frac{\operatorname{ctg} x \cdot (1-\cos^2 3x)}{x^2+5x} = \frac{\infty(1-1)}{0+0} = \left[\frac{0}{0}\right]$$

$$= \frac{\cos x \cdot (1-\cos^2 3x)}{\sin x\,(x^2+5x)} = \frac{1\cdot(1-\cos^2 3x)}{\sin x \cdot x(x+5)} =$$

$$= \frac{\sin^2 3x}{\sin x \cdot x\,(x+5)} = \frac{\sin 3x \cdot \sin 3x}{\sin x \cdot x \cdot 5} =$$

$$= \frac{1}{5} \cdot \frac{\sin 3x \cdot \sin 3x}{3x \cdot \sin x \cdot \frac{1}{3}} = \frac{1}{5} \cdot \frac{\sin 3x \cdot x}{\sin x \cdot \frac{1}{3} \cdot 3x \cdot \frac{1}{3}} = \frac{1}{5} \cdot \frac{1}{\frac{1}{3}} = \frac{9}{5}$$

$$\boxed{\sin^2 = 1-\cos^2 x}$$

+