برخط فهمیده

بنام خدا

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هم ارزی های مثلثاتی

$$\boxed{\lim_{x\to 0}\frac{\tan x}{x}=1}$$

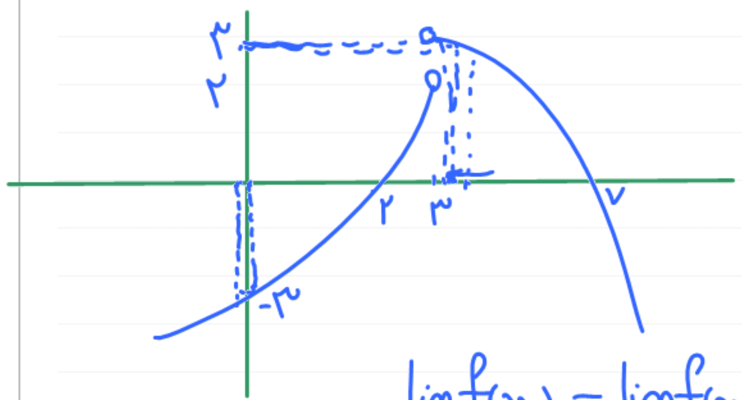
$$\lim_{x\to 0}\frac{x}{\sin x}=1$$

$$\lim_{x\to 0}\frac{\sin x}{x}=1 \qquad \lim_{x\to 0}\frac{\sin 2x}{2x}=1$$

* $$\lim_{x\to 0}\frac{\sin 5x}{x}=\lim_{x\to 0}5\times\frac{\sin 5x}{5x}=5\times 1=5$$

* $$\lim_{x\to \frac{\pi}{8}}\frac{\sin(2x-\frac{\pi}{4})}{x-\frac{\pi}{8}}=\lim_{x\to \frac{\pi}{8}}\frac{\sin(2x-\frac{\pi}{4})}{2x-\frac{\pi}{4}}\times 2=1\times 2=2$$

* $$\lim_{x\to 0}\frac{\sin x\sin 2x\sin 3x}{6x^3}=\lim_{x\to 0}\left(\frac{\sin x}{x}\times\frac{\sin 2x}{2x}\times\frac{\sin 3x}{3x}\right)=1\times 1\times 1=1$$



$$\left.\begin{array}{l}\lim_{x\to 3^+}f(x)=3\\ \lim_{x\to 3^-}f(x)=2\end{array}\right\}\ \lim_{x\to 3}f(x)\overset{\text{موجود نیست}}{=}$$

$$\lim_{x\to 2^+}f(x)=\lim_{x\to 2^-}f(x)=\lim_{x\to 2}f(x)=0$$

$$\lim_{x\to 0^+}f(x)=\lim_{x\to 0^-}f(x)=\lim_{x\to 0}f(x)=-3$$

$$\sin u\sim u \quad (u\to 0) \qquad 1-\cos u\sim\frac{u^2}{2}$$

$$\tan u\sim u \quad (u\to 0)$$

$$1-\cos u=2\sin^2\frac{u}{2}=2\times\sin\frac{u}{2}\times\sin\frac{u}{2}\sim 2\times\frac{u}{2}\times\frac{u}{2}=\frac{u^2}{2} \quad (u\to 0)$$

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

$$\lim_{x\to 0}\frac{\sin x\sin 2x\sin 3x}{6x^3}=\lim\left(\frac{x(2x)(3x)}{6x^3}\right)=1$$

$$\lim_{x\to 0}\frac{1-\cos 3x}{x^2}=\lim_{x\to 0}\frac{\frac{9x^2}{2}}{x^2}=\frac{9}{2}$$

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

$$\lim_{x\to 0}\frac{\cos 6x-\cos 8x}{3x^2}=\lim_{x\to 0}\frac{\boxed{(1-\cos 8x)}-\boxed{(1-\cos 6x)}}{3x^2}=\lim_{x\to 0}\frac{32x^2-18x^2}{3x^2}=\frac{14}{3}$$

$$1-\cos u\sim\frac{u^2}{2}\longrightarrow \cos u\sim 1-\frac{u^2}{2}$$

$$\lim_{x\to 0}\frac{\cos 6x-\cos 8x}{3x^2}=\lim_{x\to 0}\frac{(1-18x^2)-(1-32x^2)}{3x^2}=\lim_{x\to 0}\frac{14x^2}{3x^2}=\frac{14}{3}$$