Trigonometric Function:

To Find Limit at x Approaches to a Point a:

By direct compensation

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

To Find One Side Limit:

By direct compensation

$$\lim_{x \to a^+} f(x) = f(a)$$

$$\lim_{x \to a^-} f(x) = f(a)$$

To Find Limit at x Approaches to a Point$\pm\infty$:

By direct compensation

$$\lim_{x \to \pm\infty} f(x) = f(\pm\infty)$$

Note:

$$\sin \pm\infty = D.N.E \, , \cos \pm\infty = D.N.E$$

$$\tan \pm\infty = D.N.E \, , \cot \pm\infty = \ D.N.E,$$

$$\sec \pm\infty = D.N.E, \csc \pm\infty = D.N.E$$

If we solve a limit of sin or cos and the answer after compensation is $0 \cdot \infty$ we use the sandwich theorem

The Vertical Asymptotic for Trigonometric Function:

a) $\boldsymbol{\sin x \, , \cos x}$
   They have not vertical asymptotes.
b) $\boldsymbol{\tan x \, , \sec x}$
   It is all $x = \pm \frac{(2n+1)}{2}\pi, \quad n = 0,1,2, \ldots$
c) $\boldsymbol{\cot x \, , \csc x}$
   It is all $x = \pm n\pi, \quad n = 0,1,2$