LIMITS OF TRIGONOMETRIC FUNCTIONS.

① F^{+}

Class: IX . Mathematics

SOLUTIONS

TEACHING TASK

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

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

Ans: C

02. $\lim_{x\to \frac{\pi}{6}} \frac{2-\sqrt{3}\cos x - \sin x}{(6x-\pi)^2} \quad \left(\frac{0}{0}\right)$

By L-Hospital Rule

$= \lim_{x\to \frac{\pi}{6}} \frac{\sqrt{3}\sin x - \cos x}{2(6x-\pi)\cdot 6} \quad \left(\frac{0}{0}\right)$

$= \lim_{x\to \frac{\pi}{6}} \frac{\sqrt{3}\cos x + \sin x}{2\cdot 6\cdot 6}$

$= \frac{\sqrt{3}\left(\frac{\sqrt{3}}{2}\right) + \frac{1}{2}}{72} = \frac{4}{2\cdot 72} = \frac{1}{36}$

Ans: D

03. $\lim_{x\to 0} \frac{\tan 2x - x}{3x - \sin x} \quad \left(\frac{0}{0}\right)$

By L-Hospital Rule

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

Ans. A

03. General method

$$\lim_{x\to 0}\frac{\tan 2x - x}{3x - \sin x}$$

$$= \lim_{x\to 0}\frac{\frac{\tan 2x}{x} - 1}{3 - \frac{\sin x}{x}} = \frac{2-1}{3-1} = \frac{1}{2}$$

Ans: A

04. $$\lim_{x\to 2}\frac{\tan(x-2)\left[x^2+(k-2)x-2k\right)}{x^2-4x+4} = 5$$

$$= \lim_{x\to 2}\frac{\tan(x-2)\left[x^2+(k-2)x-2k\right)}{(x-2)^2} = 5$$

$$= \lim_{x\to 2}\frac{x^2+(k-2)x-2k}{x-2} = 5$$

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

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

L-Hospital Rule

$$\Rightarrow \lim_{x\to 2}\frac{2x+(k-2)}{1} = 5$$

$$4+k-2 = 5$$

$$\Rightarrow k = 3$$

Ans. B

05. $$\lim_{x\to 2}\frac{\sqrt{1-\cos\{2(x-2)\}}}{x-2}$$

$$= \lim_{x\to 2}\frac{\sqrt{2\sin^2(x-2)}}{x-2}$$

$$= \sqrt{2}\cdot\lim_{x\to 2}\frac{|\sin(x-2)|}{x-2}$$

$$= \sqrt{2}\cdot\lim_{x\to 2}\pm\frac{\sin(x-2)}{(x-2)}$$

LHL $x\to 2^+$

$x-2>0$

$\sin(x-2)>0$.

$\therefore$ LHL $=\sqrt{2}$

RHL. $x\to 2^-$

$x-2<0$

$\sin(x-2)<0$

RHL $=-\sqrt{2}$

$\therefore$ LHL $\neq$ RHL

Ans: B

(3)

06 We know

$$-1 \le \sin\left(\frac{2}{x}\right) \le 1$$

$$-x^2 \le x^2 \sin\left(\frac{2}{x}\right) \le x^2$$

$$\therefore \lim_{x \to 0} -x^2 = \lim_{x \to 0} x^2 = 0$$

Hence, $\lim_{x \to 0} x^2 \sin\left(\frac{2}{x}\right) = 0$

Ans: B

07.

$$\lim_{x \to \infty} \frac{2x^2 - \sin 3x}{x^2 + 10}$$

$$\lim_{x \to \infty} \frac{2 - \frac{\sin 3x}{x^2}}{1 + \frac{10}{x^2}}$$

$$= \lim_{\frac{1}{x} \to 0} \frac{2 - \frac{1}{x} \cdot \left(\frac{\sin 3x}{x}\right)}{1 + \frac{10}{x^2}}$$

$$= \frac{2 - 0 \times \text{finite value}}{1 + 0} = 2$$

Ans: 2

08

$$\lim_{x \to 0} \frac{a^{\tan x} - a^{\sin x}}{\tan x - \sin x} \quad \left(\frac{0}{0}\right)$$

$$\cancel{= \lim_{x \to 0} \frac{a^{\tan x} \cdot \log a \cdot \sec^2 x - a^{\sin x} \cdot \log a \cdot \cos x}{\sec^2 x - \cos x}}$$

$$= \lim_{x \to 0} \frac{a^{\sin x}\left(a^{\tan x - \sin x} - 1\right)}{(\tan x - \sin x)} = a^{\sin 0} \cdot \log a$$

$$= \log a$$

Ans: A

(4)

09. $\lim_{x \to \infty} 2^{x-1} \cdot \tan\left(\frac{a}{2^x}\right)$

$= \lim_{x \to \infty} \frac{2^x}{2} \cdot \tan\left(\frac{a}{2^x}\right)$

$\Rightarrow \frac{1}{2} \cdot \lim_{\frac{1}{2^x} \to 0} \frac{\tan\left(\frac{a}{2^x}\right)}{\left(\frac{1}{2^x}\right)}$

$= \frac{1}{2} \times a = \frac{a}{2}$

Ans: A

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10 $\lim_{x \to 0} \frac{(1-\cos 2x)(3+\cos x)}{x \tan 4x}$

$= \lim_{x \to 0} \frac{2\sin^2 x \; (3+1)}{x^2 \frac{\tan 4x}{x}} = \frac{2 \times 4}{4} = 2$

Ans: C

JEE ADVANCED LEVEL

01. $\lim_{x \to 0} x^n \cdot \sin\left(\frac{1}{x^2}\right)$.

let $n = 2$

$\therefore \lim_{x \to 0} x^2 \cdot \sin\left(\frac{1}{x^2}\right) = 0$.

let $n = -2$

$\lim_{x \to 0} x^{-2} \cdot \sin\left(\frac{1}{x^2}\right)$

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

$-1 \le \sin\left(\frac{1}{x^2}\right) \le 1$

$-\frac{1}{x^2} \le \frac{\sin\left(\frac{1}{x^2}\right)}{x^2} \le \frac{1}{x^2}$

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

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

$\therefore n < 0$, $\lim_{x \to 0} f(x)$

Does not exists

Ans: A, B

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02 $L = \lim_{x \to a} \frac{|2\sin x - 1|}{2\sin x - 1}$ (5)

A) When $a = \frac{\pi}{6}$

$$\lim_{x \to \frac{\pi}{6}} \frac{|2\sin x - 1|}{2\sin x - 1}$$

LHL: $x \to \frac{\pi}{6}^-$

$\Rightarrow x < \frac{\pi}{6}$

$\Rightarrow \sin x < \sin\frac{\pi}{6}$

$\Rightarrow \sin x < \frac{1}{2}$

$\Rightarrow 2\sin x - 1 < 0$

$\therefore |2\sin x - 1| = -(2\sin x - 1)$

$\therefore \lim_{x \to \frac{\pi}{6}^-} \frac{-(2\sin x - 1)}{2\sin x - 1} = -1$

RHL. $x \to \frac{\pi}{6}^+$

$x > \frac{\pi}{6}$

$\sin x > \sin\frac{\pi}{6}$

$\sin x > \frac{1}{2}$

$2\sin x - 1 > 0$

$|2\sin x - 1| = 2\sin x - 1$

$\lim_{x \to \frac{\pi}{6}^+} \frac{2\sin x - 1}{2\sin x - 1} = 1$

LHL $\neq$ RHL

$\therefore \lim_{x \to 0} f(x)$ Does not exits.

B) $\lim_{x \to \pi} \frac{|2\sin x - 1|}{2\sin x - 1} = \frac{|2\sin\pi - 1|}{2\sin\pi - 1} = \frac{|-1|}{-1} = -1$

C) $\lim_{x \to \frac{\pi}{2}} \frac{|2\sin\frac{\pi}{2} - 1|}{2\sin\frac{\pi}{2} - 1} = \frac{|2\cdot 1 - 1|}{2\cdot 1 - 1} = \frac{1}{1} = 1$

D) $\lim_{x \to 0} \frac{|2\sin 0 - 1|}{2\sin 0 - 1} = \frac{|-1|}{-1} = -1$

Ans: A, B, C

03. Assertion (A): $\lim_{x\to 0} \frac{\sqrt{1-\cos 2x}}{x}$

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

$$= \lim_{x\to 0} \frac{\sqrt{2}\,|\sin x|}{x}$$

$$LHL = \lim_{x\to 0^-} \frac{\sqrt{2}\cdot(-\sin x)}{x} = -\sqrt{2}$$

$$RHL: \lim_{x\to 0^+} \frac{\sqrt{2}\cdot\sin x}{x} = \sqrt{2}$$

$LHL \neq RHL$ $\therefore \lim_{x\to 0} f(x)$ does not exist

(True)

Reason: $\lim_{x\to 0} \frac{|x|}{x}$

$$LHL \Rightarrow \lim_{x\to 0^-} \frac{-x}{x} = -1$$

$$RHL = \lim_{x\to 0^+} \frac{x}{x} = 1$$

$\lim_{x\to 0} f(x)$ Does not exist

B

04 <u>Assertion (A)</u> $\lim_{x \to 0} \frac{\sin x - x}{x^3}$

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

$= \lim_{x \to 0} \frac{-\sin x}{6x} = -\frac{1}{6}$ (True)

<u>Reason (R)</u>: $\lim_{x \to 0} \frac{e^{x^2} - \cos x}{x^2}$

$= \lim_{x \to 0} \frac{(e^{x^2} - 1) + (1 - \cos x)}{x^2}$

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

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

$= 1 + 2 \cdot \left(\frac{1}{2}\right)^2 = 1 + \frac{1}{2} = 3/2$ (True)

Ans: A

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05 <u>Assertion (A)</u>: $\lim_{x \to 0} \frac{\sqrt{1 - \cos 2x}}{x}$

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

$= \sqrt{2} \cdot \lim_{x \to 0} \frac{|\sin x|}{x}$

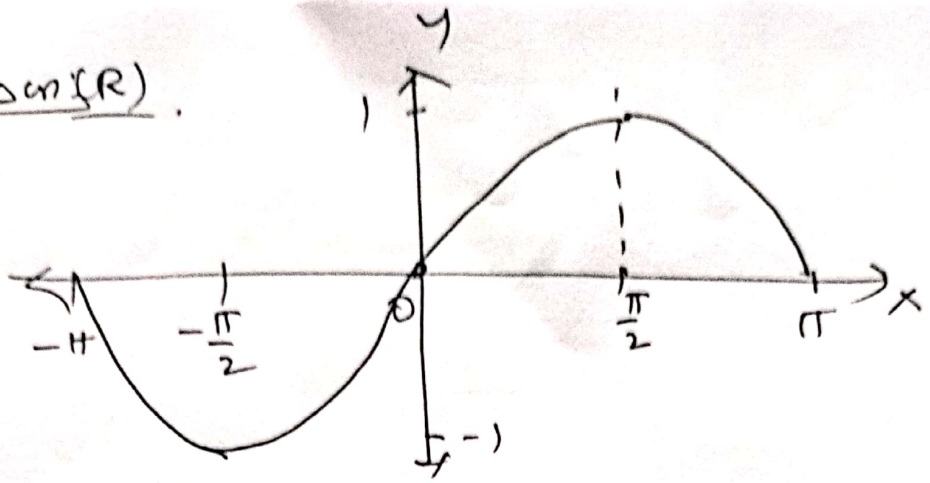
LHL $\neq$ RHL

$\therefore$ limit does not exists

: LHL $\Rightarrow \sqrt{2} \cdot \lim_{x \to 0^-} \frac{-\sin x}{x} = -\sqrt{2}$

RHL $\Rightarrow \sqrt{2} \cdot \lim_{x \to 0^+} \frac{\sin x}{x} = \sqrt{2}$

Reason (R)



clearly $0 < x < \frac{\pi}{2} \Rightarrow \sin x > 0 \Rightarrow |\sin x| = \sin x$

$-\frac{\pi}{2} < x < 0 \Rightarrow \sin x < 0 \Rightarrow |\sin x| = -\sin x$

(True)

Ans: B

06. (i) $\lim_{x \to 0} \frac{\sin x^\circ}{x}$

$= \lim_{x \to 0} \frac{\sin \frac{\pi x}{180}}{x} = \frac{\pi}{180}$

(ii) $\lim_{x \to 0} \frac{\tan 2x - x}{3x - \sin x} = \lim_{x \to 0} \frac{\frac{\tan 2x}{x} - 1}{3 - \frac{\sin x}{x}} = \frac{2-1}{3-1} = \frac{1}{2}$

(iii) $\lim_{x \to 0} \frac{\sin(\pi \cos^2 x)}{x^2}$

$= \lim_{x \to 0} \frac{\sin(\pi(1-\sin^2 x))}{x^2}$

$= \lim_{x \to 0} \frac{\sin(\pi - \pi \sin^2 x)}{x^2}$

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

$= \lim_{x \to 0} \frac{\sin(\pi \sin^2 x)}{(\pi \sin^2 x)} \times \frac{\pi \sin^2 x}{x^2}$

$= 1 \times \pi$

$= \pi$

(iv) $\lim\limits_{x\to\infty} 2^{x-1} \cdot \tan\left(\frac{a}{2^x}\right)$

$= \frac{1}{2} \lim\limits_{x\to\infty} 2^x \cdot \tan\left(\frac{a}{2^x}\right)$

$= \frac{1}{2} \lim\limits_{x\to\infty} \frac{\tan\left(\frac{a}{2^x}\right)}{\left(\frac{1}{2^x}\right)}$

Let $\frac{1}{2^x} = k$

As $x\to\infty$, $k \to 0$

$= \frac{1}{2} \lim\limits_{k\to 0} \frac{\tan ak}{k} = \frac{a}{2}$

An: D, A, B, C

7 (i) $\lim\limits_{x\to 0} \frac{\sqrt{1+\tan x} - \sqrt{1-\tan x}}{\sin x}$

$= \lim\limits_{x\to 0} \frac{\frac{1}{2\sqrt{1+\tan x}} \times \sec^2 x + \frac{1}{2\sqrt{1-\tan x}} \cdot \sec^2 x}{\cos x}$

$= \frac{1}{2} + \frac{1}{2} = 1$

(ii) $\lim\limits_{x\to 0} \frac{1-\cos 2x^\circ}{x^2}$

$= \lim\limits_{x\to 0} \frac{2\sin^2 x^\circ}{x^2}$

$= 2 \lim\limits_{x\to 0} \frac{\sin^2 \frac{\pi x}{180}}{x^2}$

$= 2\left(\frac{\pi}{180}\right)^2$

(iii) $\lim_{x\to 0} \frac{1-\cos x}{x\log(1+x)}$

$= \lim_{x\to 0} \frac{2\sin^2 x/2}{x^2 \frac{\log(1+x)}{x}} = 2\left(\frac{1}{2}\right)^2 = \frac{1}{2}$

(v) $\lim_{x\to 0} \frac{e^x - e^{\sin x}}{x(x-\sin x)}$

$= \frac{1}{x} \lim_{x\to 0} e^{\sin x} \frac{\left(e^{x-\sin x} - 1\right)}{(x-\sin x)}$

$= \frac{1}{2}.$

Ans: F, A, C, C

08

$-1 \le \cos\left(\frac{2}{x}\right) \le 1$

$-x^3 \le x^3 \cos\left(\frac{2}{x}\right) \le x^3$

$\lim_{x\to 0} -x^3 = \lim_{x\to 0} x^3 = 0$

$\therefore \lim_{x\to 0} x^3 \cdot \cos\left(\frac{2}{x}\right) = 0.$

Ans: A

09

$0 \le \sin^2 x \le 1$

$2 \le 2+\sin^2 x \le 3$

$2x^2 \le x^2(2+\sin^2 x) \le 3x^2$

$\frac{2x^2}{x+100} \le \frac{x^2(2+\sin^2 x)}{x+100} \le \frac{3x^2}{x+100}$

$\cancel{\frac{2}{\left(\frac{1}{x}+\frac{100}{x^2}\right)} \le f(x) \le \frac{3}{\frac{1}{x}+\frac{100}{x^2}}}$

$\lim_{x \to \infty} \frac{2x^2}{x+100} = \infty$

$\lim_{x \to \infty} \frac{3x^2}{x+100} = \infty$ Ans: C

10. $-1 \leq \sin\left(\frac{4}{x}\right) \leq 1$

$-x^2 \leq x^2 \sin\left(\frac{4}{x}\right) \leq x^2$

$\therefore \lim_{x \to 0} -x^2 = \lim_{x \to 0} x^2 = 0$

$\therefore \lim_{x \to 0} x^2 \sin\left(\frac{4}{x}\right) = 0$ Ans: A

LEARNERS TASK

CUQ's

01. $\lim_{(x-a) \to 0} \frac{\tan(x-a)}{(x-a)} = 1$ Ans: A

02. 3 Ans: E

03. $\frac{a}{b}$ Ans: D

04. $\lim_{x \to 0} \frac{1-\cos 4x}{1-\cos 6x}$

$= \lim_{x \to 0} \frac{2\sin^2 2x}{2\sin^2 3x} = \frac{2^2}{3^2} = \frac{4}{9}$ Ans: B

05. 1 Ans: B

06. ~~Sam~~ Conceptual Ans: C

07. Conceptual Ans: C

08. 1 Ans: D

09. Conceptual Ans: C

10. Conceptual. Ans: A

JEE MAINS LEVEL

01. $\lim_{x\to 0} \frac{\sin 7x + \sin 5x}{\tan 5x - \tan 2x} = \frac{7+5}{5-2} = \frac{12}{3} = 4$

Ans: B

02. $\lim_{x\to 2} \frac{x^2 - x - 2}{2x - \sin(x-2)}$

$= \lim_{x\to 2} \cancel{(x-2)}\cancel{(x+1)} \frac{2x-1}{2-\cos(x-2)}$

$= \frac{2\cdot 2 - 1}{2-1} = \frac{3}{1} = 3$

Ans: D

03. $\lim_{x\to 0} \frac{\sec ax - \sec bx}{x^2}$

$\lim_{x\to 0} \frac{\sec ax \cdot \tan ax \cdot a - \sec bx \cdot \tan bx \cdot b}{2x}$

$= \frac{1}{2} \cdot \lim_{x\to 0} \left[\sec ax \cdot \frac{\tan ax}{x} a - \sec bx \cdot \frac{\tan bx}{x} \cdot b\right]$

$= \frac{1}{2}(a^2 - b^2)$

Ans: A

04. $\lim_{x\to 5^-} \frac{\sin^2(x-5) \cdot \tan(x-5)}{(x+5)(x-5)\cdot(x-5)}$

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

$= 1 \times 0$

$= 0$

Ans: C

05. $$\lim_{x\to\frac{\pi}{4}} \frac{1-\cot^3 x}{2-\cot x-\cot^3 x} \quad \left(\frac{0}{0}\right)$$

$$= \lim_{x\to\frac{\pi}{4}} \frac{-3\cot^3 x\cdot(-\csc^2 x)}{-(-\csc^2 x)-3\cot^2 x\cdot(-\csc^2 x)}$$

$$= \lim_{x\to\frac{\pi}{4}} \frac{3\cot^3 x\cdot\csc^2 x}{\csc^2 x+3\cot^2 x\cdot\csc^2 x}$$

$$= \frac{3\cdot(\sqrt{2})^2}{(\sqrt{2})^2+3(\sqrt{2})^2} = \frac{6}{8} = \frac{3}{4}$$

Ans: B

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06 $$\lim_{x\to\infty} 2^{x-1}\cdot\tan\left(\frac{a}{2^x}\right) = \frac{a}{2}$$

Ans: A

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07. $$\lim_{x\to\infty} x\left(\tan^{-1}\left(\frac{x+1}{x+4}\right)-\frac{\pi}{4}\right)$$

$$= \lim_{x\to\infty} x\left(\tan^{-1}\left(\frac{x+1}{x+4}\right)-\tan^{-1}(1)\right)$$

$$= \lim_{x\to\infty} x\left(\tan^{-1}\left(\frac{\frac{x+1}{x+4}-1}{1+\frac{x+1}{x+4}\cdot 1}\right)\right)$$

$$= \lim_{x\to\infty} x\left(\tan^{-1}\left(\frac{-3}{2x+5}\right)\right)$$

$$\Rightarrow \lim_{x\to\infty} \frac{\tan^{-1}\left(\frac{-3}{2x+5}\right)}{\left(\frac{-3}{2x+5}\right)} \times \lim_{x\to\infty} \frac{-3x}{2x+5}$$

$$= 1\times -\frac{3}{2} = -\frac{3}{2}$$

Ans: C

08. $\underset{x\to 1}{Lt} \dfrac{a^{x-1}-1}{\sin \pi x}$ $\left(\frac{0}{0}\right)$

$= \underset{x\to 1}{Lt} \dfrac{a^{x-1} \cdot \log(a)}{\cos \pi x \cdot \pi}$

$= -\dfrac{\log a}{\pi}$ Ans: C

09. $\underset{x\to 2}{Lt} \dfrac{\sin\left(e^{x-2}-1\right)}{\log(x-1)}$ $\left(\frac{0}{0}\right)$

$= \underset{x\to 2}{Lt} \dfrac{\cos\left(e^{x-2}-1\right) \cdot e^{x-2}}{\left(\frac{1}{x-1}\right)} = 1$ Ans: A

10. $\underset{x\to 0}{Lt} \dfrac{a^{\cancel{\tan x}} - a^{\sin x}}{\tan x - \sin x} = \ln a$ Ans. A

JEE ADVANCED

01. $\underset{x\to 0}{Lt} \dfrac{\sin x - 2\sin 3x + \sin 5x}{x} = 1 - 2\cdot 3 + 5$
$= 0$

opt: A $\Rightarrow 0$

opt B. $\underset{x\to \frac{\pi}{2}}{Lt} \cos x = \cos\frac{\pi}{2} = 0$

opt C: $\underset{x\to 0}{Lt} \dfrac{x^3-2x}{\cos x} = \dfrac{0^3-2\cdot 0}{\cos 0} = \dfrac{0}{1} = 0$

Ans: A, B, C

02. $\underset{x\to \frac{\pi}{2}}{Lt} \dfrac{\tan 2x}{x-\frac{\pi}{2}} = \underset{x\to \frac{\pi}{2}}{Lt} \dfrac{\sec^2 2x \cdot 2}{1} = 2$

opt A $\Rightarrow \lim_{x \to 0} \frac{\sin 2x}{x} = 2$

opt D $\Rightarrow 2$

Ans: A, D

03. Assertion (A): $\lim_{x \to 0} \frac{\sin^{-1} 3x}{\tan^{-1} 6x} = \frac{3}{6} = \frac{1}{2}$ (True)

Reason (R): Conceptual (True)

Ans: A

04. Assertion (A): Conceptual (True)

Reason (R): Conceptual (True)

Ans: B

05 (i) $\lim_{x \to 0} \frac{|\sin x|}{x}$ = Does not exist

(ii) $\lim_{x \to 0} \frac{\sin x^\circ}{x} = \frac{\pi}{180}$

(iii) $\lim_{x \to 0} \frac{|x|}{x}$ = Does not exists

(iv) $\lim_{x \to a} \sin^{-1} x = \sin^{-1} a \Leftrightarrow -1 \le a \le 1$

i.e. $|a| \le 1$

Ans: F, A, F, B

06. (i) $\lim_{x \to 0} \frac{\sin^2 2x}{\sin^2 4x} = \frac{(2)^2}{(4)^2} = \frac{4}{16} = \frac{1}{4}$

(ii) $\lim_{x \to \pi} \frac{\sin x}{x - \pi} = \lim_{(x-\pi) \to 0} \frac{-\sin(x-\pi)}{(x-\pi)} = -1$

(iii) $\lim_{x \to 0} \frac{\sin x}{\sqrt{x+1} - \sqrt{1-x}} \times \frac{\sqrt{x+1} + \sqrt{1-x}}{\sqrt{x+1} + \sqrt{1-x}}$

$$= \lim_{x\to 0} \frac{\sin x}{2x} \cdot \left(\sqrt{x+1} + \sqrt{1-x}\right)$$

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

(iv) $\lim_{x\to 0} |\cos x| = 1.$

Ans: D, A, C, C

07. $\lim_{x\to 0} \frac{\sin^{-1}5x + \sin^{-1}x}{\sin^{-1}x + \sin^{-1}3x} = \frac{5+1}{1+3} = \frac{6}{4} = \frac{3}{2}$

Ans: D

08. $\lim_{x\to 0} \frac{\sin 3x + \tan 4x}{\tan 3x + \tan x} = \frac{3+4}{3+1} = \frac{7}{4}$

Ans: A

09. $\cancel{\lim_{x\to 0} \frac{\sin^{-1}3x - \tan 4x}{\tan 3x + \sin^{-1}x}} = \cancel{\frac{3-4}{3+1}} = \cancel{\frac{-1}{4}}$

09. $\lim_{x\to 0} \frac{\sin^{-1}3x - \tan 4x}{\tan 3x + \sin^{-1}x} \quad \left(\frac{0}{0}\right)$

$$= \lim_{x\to 0} \frac{\frac{1}{\sqrt{1-9x^2}} \times 3 - \sec^2 4x \cdot 4}{\sec^2 3x \cdot 3 + \frac{1}{\sqrt{1-x^2}}} = \frac{3-4}{3+1} = \frac{-1}{4}$$

Ans: —

10. $\lim_{x\to 0} \frac{\sin 3x + \sin 7x}{\tan 3x + \tan 7x} = \frac{3+7}{3+7} = \frac{10}{10} = 1$

Ans: C

$\Rightarrow$ THE END $\Leftarrow$