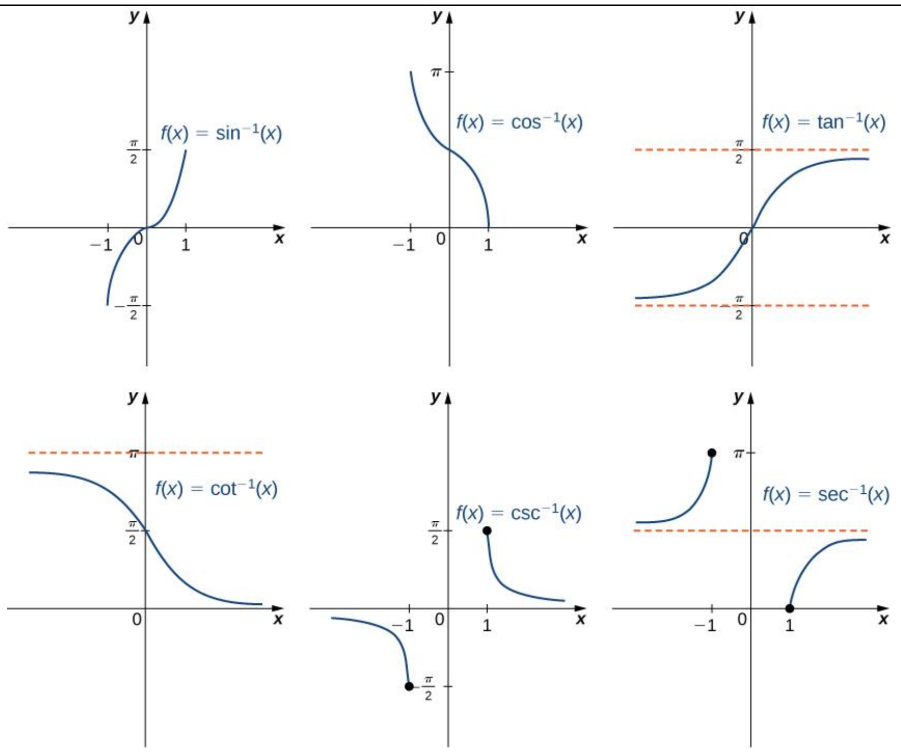
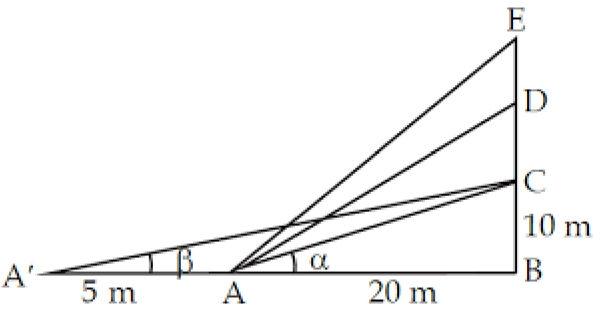
CHAPTER-2
INVERSE TRIGONOMETRIC FUNCTION
CLASS-XII
05 MARKS TYPE QUESTIONS

Q. NO	QUESTION	MARK
1.	 Based on the above graphs answer the following. i)Find the domain of $\tan^{-1}x$. ii) Find the principal value branch of $\text{cosec}^{-1}x$. iii) Write another two branch of $\sin^{-1}x$ other than principal value branch. iv) If x < 0, then find the value of $\tan^{-1} x + \tan^{-1}\frac{1}{x}$. v) Find the domain of $\sin^{-1}(2x – 3)$	5
2.	Let f: A→B be a bijective function then f^{-1}: B→ A is a function such that $f(f^{-1}(x)) = x$ for all x ∈ B and $f^{-1}(f(x)) = x$ for all x ∈ A. For ensuring bijectivity, domain of trigonometric function are restricted. Based on the above information, answer the following questions. i)Find the value of $\sin^{-1}(\sin 10)$. ii) Find the value of $\tan^{-1} \left(\sqrt{\frac{1-\cos x}{1+\cos x}}\right)$ if x∈ $(-\pi , \pi)$. iii) Express $\sin(\tan^{-1} x)$ in terms of x only. iv) Express the function $\cos (\text{cosec}^{-1} x)$ in terms of x only. v) Is $\sin^{-1} x$ equal to $(\sin x)^{-1}$?	5
3.	The government of India is planning to fix a hoarding board at the face of a building on the road of a busy market for awareness on COVID-19 protocol. Ram, Robert and Rahim are the three engineers who are working on this project "A" is considered to be a person viewing the hoarding board 20 meter away from the building , standing at the edge of a pathway nearby. Ram, Robert and Rahim suggested to the firm to place the hoarding board at three different locations namely C,D and E."C" is at the height of 10 meter from the ground level .For the viewer "A" ,the angle of elevation of "D" is double the angle of elevation of "C". The angle of elevation of "E" is triple the angle of elevation of "C" for the same viewer. Look at the figure given and based on the above information answer the following;	5



(i)measure the angle <CAB=--------

(a)$\tan^{-1}2$ (b)$\tan^{-1}1$ (c)$\tan^{-1}(\frac{1}{2})$ (d)$\tan^{-1}3$

(ii)Measure of $< DAB$=-----------

(a)$\tan^{-1}(\frac{3}{4})$ (b)$\tan^{-1}3$ (c)$\tan^{-1}(\frac{4}{3})$ (d)$\tan^{-1}4$

(iii)measure of $< EAB =$----------

(a)$\tan^{-1}11$ (b)$\tan^{-1}3$ (c)$\tan^{-1}\frac{2}{11}$ (d)$\tan^{-1}\frac{11}{2}$

(iv) A is another viewer standing on the same line of observation across the road .if the width of the road is 5meter , then the difference between <C’AB and <CA’B is

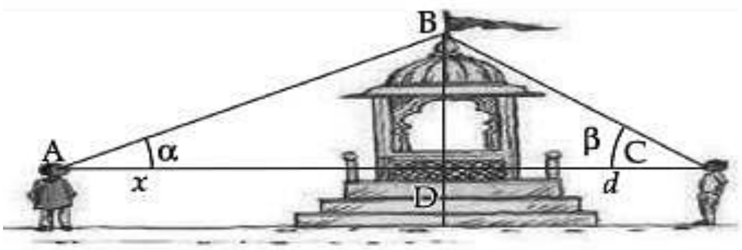
(a)$\tan^{-1}\frac{1}{12}$ (b)$\tan^{-1}\frac{1}{8}$ (c)$\tan^{-1}\frac{2}{5}$ (d)$\tan^{-1}\frac{11}{21}$

(v) Domain and range of $\tan^{-1} x$ =

(a) $R^+,(\frac{-\pi}{2},\frac{\pi}{2})$ (b) R^- ,$(\frac{-\pi}{2},\frac{\pi}{2})$ (c) R, ,$(\frac{-\pi}{2},\frac{\pi}{2})$

(d) R, $(0,\frac{\pi}{2})$

4. Two men on either side of a temple of 30m high observe its top at the angles of elevation α and β respectively. The distance between the two men is $40\sqrt{3}$m and the distance between the first person A and the temple is $30\sqrt{3}$ 5



Based on the above information answer the following questions

(i)$< CAB = \alpha =$

(a)$\sin^{-1}\frac{2}{\sqrt{3}}$ (b) $\sin^{-1}\frac{1}{2}$ (c)$\sin^{-1}2$ (d) $\sin^{-1}\frac{\sqrt{3}}{2}$

(ii))$< CAB = \alpha =$

(a)$\cos^{-1}\frac{1}{5}$ (b) $\cos^{-1}\frac{2}{5}$ (c) $\cos^{-1}\frac{\sqrt{3}}{2}$ (d) $\cos^{-1}\frac{4}{5}$

(iii)$< BCA$ =β=

(a)$\tan^{-1}\frac{1}{2}$ (b) $\tan^{-1}2$ (c) $\tan^{-1}\frac{1}{\sqrt{3}}$ (d) $\tan^{-1}\sqrt{3}$

(iv)$< ABC =$

(a)$\frac{\pi}{4}$ (b) $\frac{\pi}{6}$ (c) $\frac{\pi}{2}$ (d) $\frac{\pi}{3}$

(v)Domain and range of $\cos^{-1}x$=

(a)(-1,1),(0,π) (b)[-1,1],(0,π)

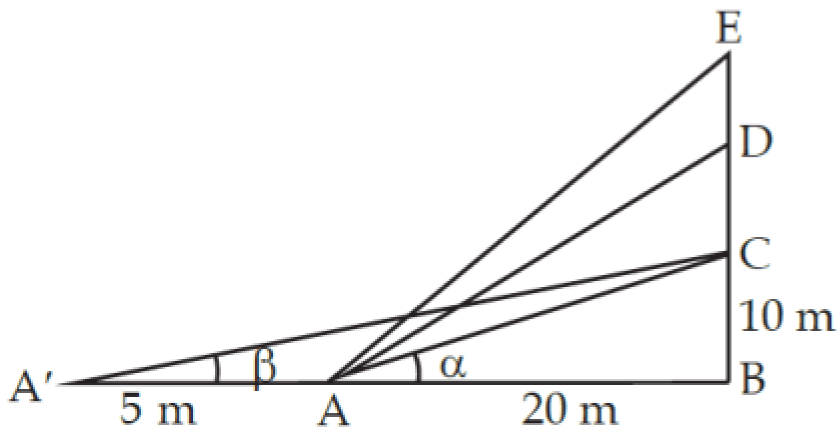
(c)[-1,1],[0,π] (d)(-1,1),$[\frac{-\pi}{2},\frac{\pi}{2}]$

5.

The Government of India is planning to fix a hoarding board at the face of a building on the road of a busy market for awareness on COVID-19 protocol. Ram, Robert and Rahim are the three engineers who are working on this project. ‘A’ is considered to be a person viewing the hoarding board 20 metres away from the building, standing at the edge of a pathway nearby, Ram Robert and Rahim suggested to the film to place the hoarding board at three different locations namely C, D and E. ‘C’ is at the height of 10 metres from the ground level. For the viewer ‘A’, the angle of elevation of ‘D’ is double the angle of elevation of ‘C’. The angle of elevation of ‘E’ is triple the angle of elevation of ‘C’ for the same viewer.

5

Look at the figure given and based on the above information answer the following:



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(i) **Measure of ∠CAB =**

(a) $\tan^{-1}(2)$
(b) $\tan^{-1}(1/2)$
(c) $\tan-^{1}(1)$
(d) $\tan^{-1}(3)$

(ii) **Measure of ∠DAB =**

(a) $\tan^{-1}(3/4)$
(b) $\tan^{-1}(3)$
(c) $\tan^{-1}(4/3)$
(d) $\tan^{-1}(4)$

(III) **Measure of ∠EAB**

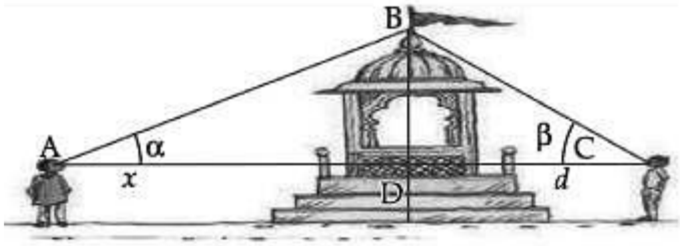
(a) $\tan^{-1}(11)$
(b) $\tan^{-1}(3)$
(c) $\tan^{-1}(2/11)$
(d) $\tan^{-1}(11/2)$

(IV) **A’ is another viewer standing on the same line of observation across the road. If the width of the road is 5 meters, then the difference between ∠CAB and ∠CA’B is**

(a) $\tan^{-1}(1/12)$
(b) $\tan^{-1}(1/8)$
(c) $\tan^{-1}(2/5)$
(d) $\tan^{-1}(11/21)$

6.

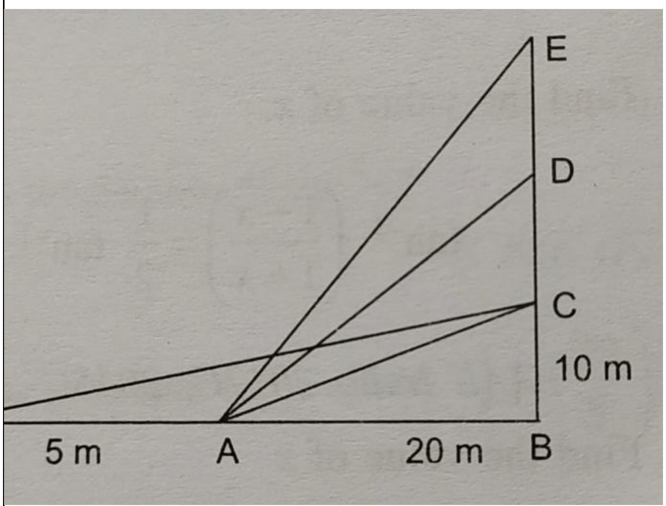
5



Two men on either side of a temple of 30 meters high observe its top at the angles of elevation α and β respectively. (as shown in the figure above). The distance between the two men is 40√3 metres and the distance between the first person A and the temple is 30√3 meters. ∠CAB = α =

- A.$\sin^{-1}(2/\sqrt{3})$
- B.$\sin^{-1}(1/2)$
- C.$\sin^{-1}(2)$
- D.$\sin^{-1}(\sqrt{3}/2)$

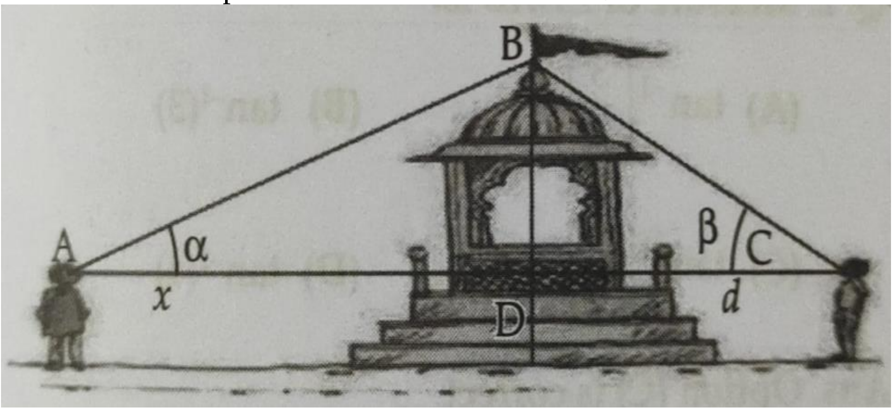
7. The municipal corporation of a city is planning to fix hoarding boards at the face of a building on the road of a busy market for awareness on keeping the city clean. Anuj, Bala and Dilip are the three engineers who are working on this project. Hoardings are placed at C,D and E on the wall. C is the height of 10 meters from the ground level D and E are above it. — 5



A is a point which is 20 meters away from the foot of the building. From A, the angle of elevation of D is doubled the angle of elevation of C. Also, from A the angle of elevation of E is triple the angle of elevation of C. Look at the figure and based on the above information answer the following:
(i) If the measure of angle CAB =$\tan^{-1} x$,Find the value of x.
(ii) If the measure of angle EAB=$\tan^{-1} z$, find the value of z.
(iii) Point P is 5 meters behind A. Then find the difference between angle CAB and CPB.
(iv) Give the domain and range of $\tan^{-1} x$

8. Two men on either side of a tower of 30 meters high observe its top at the angles of elevation α and β respectively. The distance between the two men is $40\sqrt{3}$ and the distance — 5

between the first person A and the tower is $30\sqrt{3}$ meters.



Based on the above information answer the following:

(i) If $angle\ CAB = \alpha = \sin^{-1} x$, find the value of x.

(ii) If angle CAB= α=$\cos^{-1} y$, find the value of y.

(iii) Find the measure of angle A.

) Give the domain and range of $\cos^{-1} y$

9. Shriya is preparing for her board exams. So, she decided to prepare chart of formulas of maths and important facts related to each chapter. For the chapter inverse trigonometry she has prepared the following table to remember the principal branch values of inverse trigonometric functions.

Functions	**Domain**	**Range (Principal Value Branches)**
$y = \sin^{-1} x$	[–1, 1]	$\left[\frac{-\pi}{2}, \frac{\pi}{2}\right]$
$y = \cos^{-1} x$	[–1, 1]	$[0, \pi]$
$y = \text{cosec}^{-1} x$	**R** – (–1,1)	$\left[\frac{-\pi}{2}, \frac{\pi}{2}\right] - \{0\}$
$y = \sec^{-1} x$	**R** – (–1, 1)	$[0, \pi] - \{\frac{\pi}{2}\}$
$y = \tan^{-1} x$	**R**	$\left(-\frac{\pi}{2}, \frac{\pi}{2}\right)$
$y = \cot^{-1} x$	**R**	$(0, \pi)$

Based on the above information, answer the following questions,

(1) Find the principal value of $\csc^{-1}(-1)$. [1]

(2) Find the principal value of $\sec^{-1}(-2)$. [1]

(3) Solve the following equation, [3]

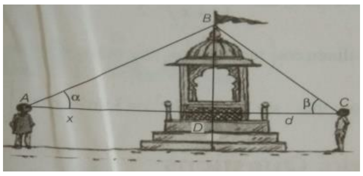
$$\tan^{-1}\left(\frac{x+1}{x-1}\right) + \tan^{-1}\left(\frac{x-1}{x}\right) = \tan^{-1}(-7)$$

5

10. If $\cos^{-1}\frac{x}{a} + \cos^{-1}\frac{y}{b} = \alpha$, prove that $\frac{x^2}{a^2} - \frac{2xy}{ab}\cos\alpha + \frac{y^2}{b^2} = sin^2\alpha$. 5

11. Prove that, $\tan\left(\frac{\pi}{4} + \frac{1}{2}\cos^{-1}\frac{a}{b}\right) + \tan\left(\frac{\pi}{4} - \frac{1}{2}\cos^{-1}\frac{a}{b}\right) = \frac{2b}{a}$ 5

12. Prove that : $\tan^{-1}\left(\frac{\cos x}{1+\sin x}\right) = \frac{\pi}{4} - \frac{x}{2},\ x \in \left(-\frac{\pi}{2}, \frac{\pi}{2}\right)$

		5
13.	Prove that : $\tan^{-1}\left(\frac{\sqrt{1+x}-\sqrt{1-x}}{\sqrt{1+x}+\sqrt{1-x}}\right)=\frac{\pi}{4}-\frac{1}{2}\cos^{-1}x,\ -\frac{1}{\sqrt{2}}\leq x\leq 1$	5
14.	Read the following passage and answer the following questions: In a school project Manish was asked to construct a triangle ABC in which two angles B and C are given by $\tan^{-1}(\frac{1}{2})$ and $\tan^{-1}(\frac{1}{3})$ respectively. (i) Find the value of sin B. (ii) Find the value of cos C. (iii) Find the value of B + C (iv) Find the value of cos (B+C) (v) Write the formula for $\tan^{-1} A + \tan^{-1} B$	5
15.	Read the following passage and answer the following questions: Two men on either side of a temple 15 metre high observe its top at the angles of elevation $\propto$ *and* β respectively (as shown in the figure). The distance between the two men is $20\sqrt{3}$ m and the distance between the first person A and the temple is $15\sqrt{3}$.  (i) Find $\propto$ in terms of $\sin^{-1}$, (ii) Find $\propto$ in terms of $\cos^{-1}$ (iii) Find β in terms of $\tan^{-1}$ (iv) Write the domain and range of $\cos^{-1}$ (v) Find $m\angle ABC$	5
16.	Prove that $\tan^{-1}[\frac{\sqrt{1+x}-\sqrt{1-x}}{\sqrt{1+x}+\sqrt{1\_x}}] = \frac{\pi}{4} - \frac{1}{2}\cos^{-1}x$, $0<x<1$	**5**
17.	Find the greatest and least values of $(\sin^{-1}x)^2 + (\cos^{-1}x)^2$.	**5**

ANSWERS:

Q. NO	ANSWER	MARKS
1.	i) Domain of $\tan^{-1}x$ is R or $(-\infty, \infty)$. ii) The principal value branch of $\text{cosec}^{-1}x$ is $[-\pi/2, 0) \cup (0, \pi/2]$ or $[-\pi/2, \pi/2] - \{0\}$ iii) Another two branches of $\sin^{-1}x$ other than principal value branch are $[\pi/2, 3\pi/2]$, $[3\pi/2, 5\pi/2]$ iv) If x < 0, then $\tan^{-1}x + \tan^{-1}\frac{1}{x} = \tan^{-1}x + \cot^{-1}x - \pi = \frac{\pi}{2} - \pi = -\pi/2$ v) To find the domain of $\sin^{-1}(2x-3)$, we can write $-1 \leq 2x-3 \leq 1 \Rightarrow -1+3 \leq 2x \leq 1+3 \Rightarrow 2 \leq 2x \leq 4$ $\Rightarrow 1 \leq x \leq 2$ So, $x \in [1,2]$	5
2.	i)As we know $3\pi < 10 < 7\pi/2$ Now, $x = \sin^{-1}(\sin 10) = \sin^{-1}(\sin \pi - 10) = \sin^{-1}(\sin 3\pi - 10)$ But $0 > 3\pi - 10 > -\pi/2$ i.e. $x = 3\pi - 10$ ii) $\frac{1-\cos x}{1+\cos x} = \tan^2(x/2)$, $x/2 \in (-\pi/2, \pi/2)$ $y = \tan^{-1}\left(\sqrt{\frac{1-\cos x}{1+\cos x}}\right) = \tan^{-1}\left(\left\| \tan\frac{x}{2} \right\|\right)$ $x > 0 \Rightarrow y = x/2$ and $x < 0 \Rightarrow y = -x/2$ iii)Let $\tan^{-1}x = \theta \Rightarrow x = \tan\theta$ $\theta \in (-\pi/2, \pi/2)$ $\text{Sin}\,\theta = \cos\theta . \tan\theta = x / \sec\theta = x / \sqrt{1+x^2}$ iv) Let $\text{cosec}^{-1}x = \theta \Rightarrow x = \text{cosec}\,\theta \Rightarrow \sin\theta = 1/x$ $\theta \in [-\pi/2, \pi/2] - \{0\}$ $\text{Cos}\,\theta = \sqrt{1 - \frac{1}{x^2}} = \frac{\sqrt{x^2-1}}{\|x\|}$ v) No, $\sin^{-1}x \neq (\sin x)^{-1}$	5
3.	solution: (i) in $\triangle$ ABC $\tan A = \frac{BC}{AB}$ $\tan A = \frac{10}{20}$ $\tan A = \frac{1}{2}$ $\angle A = \tan^{-1}\frac{1}{2}$ $\angle CAB = \tan^{-1}(\frac{1}{2})$ (ii)given that $\angle DAB = 2 \times \angle CAB$ $= 2 \times \tan^{-1}(\frac{1}{2})$ Using $2\tan^{-1}x = \tan^{-1}\frac{2x}{1-x^2}$	5

$=\tan^{-1}\left(\frac{2\times\frac{1}{2}}{1-(\frac{1}{2})^2}\right)$

$=\tan^{-1}\left(\frac{1}{1-\frac{1}{4}}\right)$

$=\tan^{-1}\left(\frac{1}{\frac{3}{4}}\right)$

$\tan^{-1}\frac{4}{3}$

(iii)given that

$<E$AB=2×<CAB

$\tan^{-1}\frac{1}{2}$

Using $3\tan^{-1}x=\tan^{-1}\frac{3x-x^3}{1-3x^2}$

$=\tan^{-1}\left(\frac{3*\frac{1-(\frac{1}{2})3}{2}}{1-3*(1/2)2}\right)$

$=\tan^{-1}\frac{(3/2)-(1/8)}{1-(3/4)}$

$=\tan^{-1}\left(\frac{\frac{3*4-1}{8}}{\frac{4-3}{4}}\right)$

$=\tan^{-1}\left(\frac{\frac{11}{8}}{\frac{1}{4}}\right)=\tan^{-1}(\{11/8\}*\{4/1\})=\tan^{-1}\frac{11}{2}$

(iv)in triangle A'BC tanA'=BC/A'B

Tan A'=10/25=2/5

Angle A'=$\tan^{-1}$(2/5)

Angle C'AB=$\tan^{-1}$(2/5)

Now,we need to find the difference between angle CAB and angle CA'B

Using tan-1x-tan-1y=$\tan^{-1}\left(\frac{x-y}{1+xy}\right)$

$=\tan^{-1}\frac{(1/2)-(2/5)}{1+((1/2)*(2/5))}$

$=\tan^{-1}\left(\frac{(5-4)/(2*5)}{1+(1/5)}\right)$

$=\tan^{-1}\left(\frac{(1/10)}{(6/5)}\right)$

$=\tan^{-1}$((1/10)*(5/6))

$=\tan^{-1}$(1/12)

(iv)since x is not defined at x=($-\pi/2$) and x=($\pi/2$)

Range of $\tan^{-1}$ excludes=($-\pi/2$) and ($-\pi/2$)

Domain of $\tan^{-1}$x is real numbers

4. Solution: 5

I) In triangle A B D

tanα= $\frac{BD}{AD}$

tanα= $\frac{30}{30\sqrt{3}}$

tanα= $\frac{1}{\sqrt{3}}$

Hence α=30° =$\frac{\pi}{6}$

Thus, sinα= sin 30°=$\frac{1}{2}$

So, sinα $=\frac{1}{2}$

α= $sin^{-1}(\frac{1}{2})$

ii) Now, α=30°=$\frac{\pi}{6}$

Thus,

Cosα =cos30° =$\sqrt{3/2}$

Hence cosα =$\sqrt{3/2}$

	Hence cosα =$\sqrt{3/2}$ α =$cos^{-1}(\sqrt{3/2})$ iii) In triangle ABD tanβ=$\frac{BD}{AD}$ tanβ=$\frac{30}{10\sqrt{3}}$ tanβ=$\frac{3}{\sqrt{3}}$ tanβ=$\sqrt{3}$ β=$\tan^{-1}(\sqrt{3\ \ })$ Also, β= $60°$=$\frac{\pi}{3}$ Iv) since α =30° and β= 60° In triangle ABC, By angle sum property α + β +Triangle ABC =180° $30° + 60° + traingle\ ABC = 180°$ Triangle ABC =90° Triangle ABC =$\frac{\pi}{2}$ v) Since $\cos x$ is defined at x=0, and π Domen of $\cos^{-1} x$ includes -1 and 1 Range of $\cos^{-1} x$ also includes 0 and π	
5.	Answer: (i) b (ii) c (iii) d (iv) a	5
6.	Ans= (b)	5
7.	(i) $\frac{1}{2}$ (ii) $\frac{11}{21}$ (iii) $\frac{1}{8}$ (iv) $\left(\frac{-\pi}{2}, 2\right)$	5
8.	(i) $\frac{1}{2}$ (ii) $\frac{\sqrt{3}}{2}$ (iii) $\frac{\pi}{2}$ (iv) [-1,1],[0, π]	5
9.	(1)Let, $\csc^{-1}(-1) = y$ Then, $-1 = \csc y$ Since principal value branch of $\csc^{-1} x$ is $\left[-\frac{\pi}{2}, \frac{\pi}{2}\right] - \{0\}$ And $\csc\left(-\frac{\pi}{2}\right) = -1$ and $-\frac{\pi}{2} \epsilon \left[-\frac{\pi}{2}, \frac{\pi}{2}\right]$ So, principal value of $\csc^{-1}(-1) = -\frac{\pi}{2}$ (2)Let $\sec^{-1}(-2) = y$ Since principal value branch of $\sec^{-1} x = [0, \pi] - \left\{\frac{\pi}{2}\right\}$ And $\sec\frac{2\pi}{3} = -2$ and $\frac{2\pi}{3} \in [0, \pi]$ So, principal value of $\sec^{-1}(-2) = \frac{2\pi}{3}$ (3)$\tan^{-1}\left(\frac{x+1}{x-1}\right) + \tan^{-1}\left(\frac{x-1}{x}\right) = \tan^{-1}(-7)$	5

	Or $\tan^{-1}\left(\frac{\frac{x+1}{x-1}+\frac{x-1}{x}}{1-\frac{x^2-1}{x(x-1)}}\right)=\tan^{-1}(-7)$ Or $\frac{x(x+1)+(x-1)^2}{x(x-1)-(x^2-1)}=-7$ Or $2x^2-8x+8=0$ Or $x=2$	
10.	$\cos^{-1}\frac{x}{a}+\cos^{-1}\frac{y}{b}=\alpha,$ $\Rightarrow\ \cos^{-1}\left(\frac{xy}{ab}-\sqrt{1-\left(\frac{x}{a}\right)^2}\sqrt{1-\left(\frac{y}{b}\right)^2}\right)=\alpha$ $\Rightarrow \frac{xy}{ab}-\sqrt{1-\left(\frac{x}{a}\right)^2}\sqrt{1-\left(\frac{y}{b}\right)^2}=cos\alpha$ $\Rightarrow\ \frac{x^2}{a^2}-\frac{2xy}{ab}\cos\alpha+\frac{y^2}{b^2}=sin^2\alpha.$	5
11.	L.H.S = $\tan\left(\frac{\pi}{4}+\frac{1}{2}\cos^{-1}\frac{a}{b}\right)+\ \tan\left(\frac{\pi}{4}-\frac{1}{2}\cos^{-1}\frac{a}{b}\right)$ $=\tan\left(\frac{\pi}{4}+x\right)+\tan\left(\frac{\pi}{4}-x\right)$ Where $\frac{1}{2}\cos^{-1}\frac{a}{b}=x$ $=\frac{1+tanx}{1-tanx}+\frac{1-tanx}{1+tanx}$ $=\ \frac{2(1+tan^2x)}{1-tan^2x}$ $=\frac{2}{cos2x}$ $=\frac{2}{cos2\left(\frac{1}{2}\cos^{-1}\frac{a}{b}\right)}$ $=\frac{2}{cos\left(\cos^{-1}\frac{a}{b}\right)}$ $=\frac{2b}{a}$	5
12.	LHS = $\tan^{-1}\left(\frac{\cos x}{1+\sin x}\right)$ $=\tan^{-1}\left(\frac{\sin\left(\frac{\pi}{2}-x\right)}{1+\cos\left(\frac{\pi}{2}-x\right)}\right)=\tan^{-1}\left(\frac{2\sin\left(\frac{\pi}{4}-\frac{x}{2}\right)\cos\left(\frac{\pi}{4}-\frac{x}{2}\right)}{2\cos^2\left(\frac{\pi}{4}-\frac{x}{2}\right)}\right)=\tan^{-1}\left(\frac{\sin\left(\frac{\pi}{4}-\frac{x}{2}\right)}{\cos\left(\frac{\pi}{4}-\frac{x}{3}\right)}\right)$ $=\tan^{-1}\left(\tan\left(\frac{\pi}{4}-\frac{x}{2}\right)\right)=\frac{\pi}{4}-\frac{x}{2}=RHS$	

13.	LHS = $\tan^{-1}\left(\frac{\sqrt{1+x}-\sqrt{1-x}}{\sqrt{1+x}+\sqrt{1-x}}\right) = \tan^{-1}\left(\frac{\sqrt{1+x}-\sqrt{1-x}}{\sqrt{1+x}+\sqrt{1-x}} \text{ x } \frac{\sqrt{1+\text{x}}-\sqrt{1-x}}{\sqrt{1+\text{x}}-\sqrt{1-x}}\right)$ $= \tan^{-1}\left(\frac{2-2\sqrt{1-x^2}}{1+x-1+x}\right) = \tan^{-1}\left(\frac{1-\sqrt{1-x^2}}{x}\right)$ Putting $\text{x} = \text{siny} \Rightarrow \text{y} = \sin^{-1}x$ $= \tan^{-1}\left(\frac{1-\cos y}{\sin y}\right) = \tan^{-1}\left(\frac{2\sin^2\frac{y}{2}}{2\sin\frac{y}{2}.\cos\frac{y}{2}}\right) = \tan^{-1}\left(\tan\frac{y}{2}\right) = \frac{y}{2} = \frac{1}{2}\sin^{-1}x$ $= \frac{1}{2}\left(\frac{\pi}{2} - \cos^{-1}x\right) = \frac{\pi}{4} - \frac{1}{2}\cos^{-1}x = RHS$	
14.	(i) the value of sin B = $\frac{1}{\sqrt{5}}$ (ii) the value of cos C= $\frac{3}{\sqrt{10}}$ (iii) the value of B + C= $\frac{\pi}{4}$ (iv) the value of cos (B+C)= $\frac{1}{\sqrt{2}}$ (v) $\tan^{-1}$ A + $\tan^{-1}$ B = $\tan^{-1}$ $\left(\frac{A+B}{1-AB}\right)$	5
15.	(i) $\propto = \sin^{-1}\frac{1}{2}$ (ii) $\propto = \cos^{-1}\frac{\sqrt{3}}{2}$ (iii) $\beta = \tan^{-1}\sqrt{3}$ (iv) domain and range of $\cos^{-1}$x = [-1,1] and [0, π] (v) $m\angle ABC = \frac{\pi}{2}$	5
16.	Put x = $\cos 2\theta$ $\tan^{-1}\left[\frac{\sqrt{1+\cos 2\theta}-\sqrt{1-\cos 2\theta}}{\sqrt{1+\cos 2\theta}+\sqrt{1-\cos 2\theta}}\right] = \frac{\pi}{4} - \frac{1}{2}\cos^{-1}x$ $\tan^{-1}\left[\frac{\sqrt{2cos^2\theta}-\sqrt{2sin^2\theta}}{\sqrt{2cos^2\theta}+\sqrt{2sin^2\theta}}\right]$ $\tan^{-1}\left[\frac{cos\theta - sin\theta}{cos\theta + sin\theta}\right]$ $\tan^{-1}\left[\frac{1-tan\theta}{1+tan\theta}\right]$ $\tan^{-1}[\tan(\frac{\pi}{4}-\theta)]$ $\frac{\pi}{4} - \theta$	5

	$\frac{\pi}{4} - \frac{1}{2}\cos^{-1}x$	
17.	$(\sin^{-1}x)^2 + (\cos^{-1}x)^2$ $(\sin^{-1}x + \cos^{-1}x)^2 - 2\sin^{-1}x\cos^{-1}x$ $\frac{\pi^2}{4} - 2\sin^{-1}x(\frac{\pi}{2} - \sin^{-1}x)$ $\frac{\pi^2}{4} - \pi\sin^{-1}x + 2(\sin^{-1}x)^2$ $2[(\sin^{-1}x - \frac{\pi}{4})^2 + \frac{\pi^2}{16}]$ Now, $-\frac{\pi}{2} \leq \sin^{-1}x \leq \frac{\pi}{2}$ $-\frac{3\pi}{4} \leq \sin^{-1}x - \frac{\pi}{4} \leq \frac{\pi}{4}$ $0 \leq (\sin^{-1}x - \frac{\pi}{4})^2 \leq \frac{9\pi^2}{16}$ $\frac{\pi^2}{16} \leq (\sin^{-1}x - \frac{\pi}{4})^2 + \frac{\pi^2}{16} \leq \frac{5\pi^2}{8}$ $\frac{\pi^2}{8} \leq 2(\sin^{-1}x - \frac{\pi}{4})^2 + \frac{\pi^2}{16} \leq \frac{5\pi^2}{4}$ Greatest value = $\frac{5\pi^2}{4}$ Least value = $\frac{\pi^2}{8}$	5