SESSION : 2025-26

DPP
DAILY PRACTICE PROBLEMS

Class : XIth
Date :

Solutions

Subject : MATHS
DPP No. :1

Topic :-TRIGONOMETRIC FUNCTIONS

1 **(c)**

We have,

$\sin x + \sin^2 x = 1 \Rightarrow \sin x = \cos^2 x$

Now,

$\cos^{12} x + 3\cos^{10} x + 3\cos^8 x + \cos^6 x - 1$

$= \cos^6 x (\cos^6 x + 3\cos^4 x + 3\cos^2 x + 1) - 1$

$= \cos^6 x (\cos^2 x + 1)^3 - 1$

$= \sin^3 x (\sin x + 1)^3 - 1$

$= (\sin^2 x + \sin x)^3 - 1$

$= (\sin^2 x + \cos^2 x)^3 - 1 \quad [\because \sin x = \cos^2 x]$

$= 1 - 1 = 0$

2 **(c)**

Let $a = 3x + 4y, b = 4x + 3y$ and $c = 5x + 5y$.

Clearly, c is the largest side and thus the largest angle C is given by

$$\cos C \frac{a^2 + b^2 - c^2}{2ab} = \frac{-2xy}{2(12x^2 + 25xy + 12y^2)} < 0$$

$\Rightarrow C$ is an obtuse angle

3 **(a)**

Let $a = x^2 + x + 1, b = x^2 - 1$ and $c = 2x + 1$.

Then,

$a - b = x + 2 > 0 \qquad [\because x > 1]$

$a - c = x^2 - x > 0 \qquad [\because x > 1]$

So, a is the largest side

Hence, the largest angle is given by

$$\cos\theta = \frac{b^2 + c^2 - a^2}{2bc}$$

$$\Rightarrow \cos\theta = \frac{(x^2 - 1)^2 + (2x + 1)^2 - (x^2 + x + 1)^2}{2(x^2 - 1)(2x + 1)} = -\frac{1}{2}$$

$\Rightarrow \theta = 2\,\pi/3 = 120°$

4 **(c)**

We have,

$$\frac{1}{2}\,a\,p_1 = \Delta, \frac{1}{2}\,b\,p_2 = \Delta, \frac{1}{2}\,c\,p_3 = \Delta$$

$$\Rightarrow p_1 = \frac{2\,\Delta}{a}, p_2 = \frac{2\,\Delta}{b}, p_3 = \frac{2\,\Delta}{c}$$

$$\therefore \frac{1}{p_1^2} + \frac{1}{p_2^2} + \frac{1}{p_3^2} = \frac{a^2 + b^2 + c^2}{4\,\Delta^2}$$

$$\frac{1}{p_1} + \frac{1}{p_2} - \frac{1}{p_3} = \frac{a}{2\,\Delta} + \frac{b}{2\,\Delta} - \frac{c}{2\,\Delta} = \frac{a + b - c}{2\,\Delta}$$

$$= \frac{2(s - c)}{2\,\Delta} = \frac{s - c}{\Delta}$$

5 **(c)**

We have,

$$\cos C = \frac{63}{65} \Rightarrow \frac{a^2 + b^2 - c^2}{2ab} = \frac{63}{65}$$

$$\Rightarrow \frac{26^2 + 30^2 - c^2}{2 \times 26 \times 30} = \frac{63}{65}$$

$$\Rightarrow 676 + 900 - c^2 = 1260 \Rightarrow c^2 = 64 \Rightarrow c = 8$$

Thus, we have

$a = 26, b = 30$ and $c = 8$

$$\therefore 2s = a + b + c \Rightarrow 2s = 26 + 30 + 8 = 64 \Rightarrow s = 32$$

Also, $\Delta = \sqrt{s(s - a)(s - b)(s - c)} = \sqrt{32 \times 6 \times 2 \times 24} = 96$

Hence, $r_2 = \dfrac{\Delta}{s - b} = \dfrac{96}{32 - 30} = 48$

6 **(c)**

$\cos 1° \cos 2° \cos 3° \ldots \cos 90° \ldots \cos 100°$

$= \cos 1° \cos 2° \cos 3° \ldots 0 \ldots \cos 100° = 0$

7 **(b)**

We have,

$$\sin\frac{\pi}{2} + \sin\frac{2\pi}{7} + \sin\frac{3\pi}{7}$$

$$= \frac{1}{2\sin\frac{\pi}{7}}\left\{2\sin^2\frac{\pi}{7} + 2\sin\frac{\pi}{7}\sin\frac{2\pi}{7} + 2\sin\frac{\pi}{7}\sin\frac{3\pi}{7}\right\}$$

$$= \frac{1}{2\sin\left(\frac{\pi}{7}\right)}\left\{1 - \cos\frac{2\pi}{7} + \cos\frac{\pi}{7} - \cos\frac{3\pi}{7} + \cos\frac{2\pi}{7} - \cos\frac{4\pi}{7}\right\}$$

$$= \frac{1}{2\sin\frac{\pi}{7}}\left\{1+\cos\frac{\pi}{7}\right\} = \frac{2\cos^2\frac{\pi}{14}}{4\sin\frac{\pi}{14}\cos\frac{\pi}{14}} = \frac{1}{2}\cot\frac{\pi}{14}$$

8 **(a)**

Let $f(x) = \sqrt{3}\cos x + \sin x$

$\Rightarrow f(x) = 2\left(\frac{\sqrt{3}}{2}\cos x + \frac{1}{2}\sin x\right) = 2\sin\left(x+\frac{\pi}{3}\right)$

Since, $-1 \leq \sin\left(x+\frac{\pi}{3}\right) \leq 1$

Hence, $f(x)$is maximum, if $x+\frac{\pi}{3} = \frac{\pi}{2}$

$\Rightarrow x = \frac{\pi}{6} = 30°$

9 **(b)**

$\sin^2 17.5° + \sin^2 72.5°$

$= \sin^2 17.5° + \cos^2 17.5°$ [

$\because \sin(9\theta - \theta) = \cos\theta$]

$= 1 = \tan^2 45°$

10 **(a)**

We have,

$a\sin A = b\sin B$

$\Rightarrow a \cdot ak = b \cdot bk \Rightarrow a = b \Rightarrow \Delta ABC$ is isosceles

11 **(b)**

We know that $\sin^2\theta \geq 1$

$\Rightarrow \frac{4xy}{(x+y)^2} \geq 1$

$\Rightarrow 4xy \geq (x+y)^2$

$\Rightarrow (x-y)^2 \leq 0$

$\Rightarrow x - y = 0 \Rightarrow y = x$

And $x \neq 0, \ y \neq 0$

12 **(b)**

Given that, $\cos\theta = \frac{1}{2}\left(x+\frac{1}{x}\right)$

$\Rightarrow x + \frac{1}{x} = 2\cos\theta$ ....(i)

We know that, $x^2 + \frac{1}{x^2} = \left(x+\frac{1}{x}\right)^2 - 2$

$= (2\cos\theta)^2 - 2 = 4\cos^2\theta - 2$

$= 2\cos 2\theta$ [from Eq.(i)]

$\therefore\ \frac{1}{2}\left(x^2+\frac{1}{x^2}\right)=\frac{1}{2}\times 2\cos 2\theta=\cos 2\theta$

13 **(d)**

$\operatorname{sech}^{-1}(\sin\theta)$

$=\cosh^{-1}(\operatorname{cosec}\theta)$

$=\log\left[\operatorname{cosec}\theta+\sqrt{(\operatorname{cosec}^2\theta-1)}\right]$

$=\log\left[\frac{1}{\sin\theta}+\frac{\cos\theta}{\sin\theta}\right]=\log\cot\frac{\theta}{2}$

14 **(d)**

Consider the curves $y=2^{\cos x}$ and $y=|\sin x|$.
Clearly, both the curves are symmetrical about y-axis as $\cos x$ and $|\sin x|$ are even functions
Also, $y=2^{\cos x}$ and $y=|\sin x|$ intersect at two points in $[0,2\pi]$
Hence, there are four solutions of the given equation

15 **(d)**

We have,

$\cos(\lambda\sin\theta)=\sin(\lambda\cos\theta)$

$\Rightarrow\cos(\lambda\sin\theta)=\cos\left(\frac{\pi}{2}-\lambda\cos\theta\right)$

$\Rightarrow\lambda\sin\theta=\frac{\pi}{2}-\lambda\cos\theta\Rightarrow\cos\theta+\sin\theta=\frac{\pi}{2\lambda}$

This equation will have a solution if

$\left|\frac{\pi}{2\lambda}\leq\sqrt{2}\right|\qquad\left[\because|a\cos\theta+b\sin\theta|\leq\sqrt{a^2+b^2}\right]$

$\Rightarrow\frac{\pi}{2\lambda}\leq\sqrt{2}\Rightarrow\lambda\geq\frac{\pi}{2\sqrt{2}}\qquad[\because\lambda>0]$

16 **(c)**

We have,

$c_1+c_2=2b\cos A$ and $c_1c_2=b^2-a^2$

$\therefore c_1-c_2=\sqrt{(c_1+c_2)^2-4c_1c_2}$

$\Rightarrow c_1-c_2=\sqrt{4b^2\cos^2A-4(b^2-a^2)}$

$=2\sqrt{a^2-b^2\sin^2A}$

17 **(b)**

We have,

$\tan\alpha=(1+2^{-x})^{-1}=\frac{2^x}{2^x+1}$ and $\tan\beta$

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

$\therefore\tan(\alpha+\beta)=\frac{\tan\alpha+\tan\beta}{1-\tan\alpha\tan\beta}$

$$\Rightarrow \tan(\alpha+\beta) = \frac{2^x(2^{x+1}+1)+(2^x+1)}{(2^x+1)(2^{x+1}+1)-2^x}$$

$$\Rightarrow \tan(\alpha+\beta) = \frac{2(2^x)^2+2.2^x+1}{2(2^x)^2+2.2^x+1} = 1 \Rightarrow \alpha+\beta$$

$$= \pi/4$$

18 **(a)**

Given, $f(x) = \sin x(1+\cos x)$

It is minimum at $x = \frac{\pi}{3}$

$$\therefore f\left(\frac{\pi}{3}\right) = \sin\left(\frac{\pi}{3}\right)\left(1+\cos\frac{\pi}{3}\right)$$

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

19 **(c)**

We have,

$$\cos\frac{\pi}{11}+\cos\frac{3\pi}{11}+\cos\frac{5\pi}{11}+\cos\frac{7\pi}{11}\cos\frac{9\pi}{11}$$

$$= \frac{\cos\left\{\frac{\pi}{11}+\left(\frac{5-1}{2}\right)\frac{2\pi}{11}\right\}\sin\left(\frac{5\pi}{11}\right)}{\sin\left(\frac{\pi}{11}\right)}$$

$$= \frac{\cos\frac{5\pi}{11}\sin\frac{5\pi}{11}}{\sin\frac{\pi}{11}} = \frac{1}{2}\frac{\sin\left(\frac{10\pi}{11}\right)}{\sin\frac{\pi}{11}} = \frac{1}{2}$$

ANSWER-KEY										
Q.	1	2	3	4	5	6	7	8	9	10
A.	C	C	C	A	C	C	C	B	A	B
Q.	11	12	13	14	15	16	17	18	19	20
A.	A	B	B	D	D	D	C	B	A	C

SESSION : 2025-26

DPP
DAILY PRACTICE PROBLEMS

Class : XIth
Subject : MATHS
Date :
DPP No. :2

Solutions

Topic :-TRIGONOMETRIC FUNCTIONS

1 **(c)**

$$\left(1+\cos\frac{\pi}{8}\right)\left(1+\cos\frac{3\pi}{8}\right)\left(1+\cos\frac{5\pi}{8}\right)\left(1+\cos\frac{7\pi}{8}\right)$$

$$=\left(1+\cos\frac{\pi}{8}\right)\left(1+\cos\frac{3\pi}{8}\right)\left(1-\cos\frac{3\pi}{8}\right)\times\left(1-\cos\frac{\pi}{8}\right)$$

$$=\left(1-\cos^2\frac{\pi}{8}\right)\left(1-\cos^2\frac{3\pi}{8}\right)$$

$$=\sin^2\frac{\pi}{8}.\sin^2\frac{3\pi}{8}=\frac{1}{4}\left[2\sin\frac{\pi}{8}\sin\frac{3\pi}{8}\right]^2$$

$$=\frac{1}{4}\left[\cos\frac{\pi}{4}-\cos\frac{\pi}{2}\right]^2=\frac{1}{4}\left[\frac{1}{\sqrt{2}}-0\right]^2=\frac{1}{8}$$

2 **(a)**

We have,

$$2\sin\frac{A}{2}=\sqrt{1+\sin A}+\sqrt{1-\sin A}$$

$$\Rightarrow 2\sin\frac{A}{2}-\sqrt{(\cos A/2+\sin A/2)^2}+\sqrt{(\cos A/2-\sin A/2)^2}$$

$$\Rightarrow 2\sin A/2=|\cos A/2+\sin A/2|+|\sin A2/-\sin A/2|$$

$\Rightarrow \cos A/2+\sin A/2\geq 0$ and $\cos A/2-\sin A/2\leq 0$

$\Rightarrow \pi/4\leq A/2\leq 3\pi/4$ and $\pi/4\leq A\leq 5\pi/4$

$\Rightarrow \pi/4\leq A/2\leq 3\pi/4$

$\Rightarrow 2n\pi+\pi/4\leq A/2\leq 2n\pi+3\pi/4, n\in Z$

3 **(a)**

We have,

$$a\cos^2\frac{C}{2}+c\cos^2\frac{A}{2}=\frac{3b}{2}$$

$$\Rightarrow a\left\{\frac{s(s-c)}{ab}\right\}+c\left\{\frac{s(s-a)}{bc}\right\}=\frac{3b}{2}$$

$$\Rightarrow \frac{s}{b}(2s-a-c)=\frac{3b}{2}$$

$\Rightarrow 2s=3b\Rightarrow a+c=2b\Rightarrow a,b,c$ are in A.P.

4 **(a)**

We have,

$$\tan(\theta_1+\theta_2+\cdots+\theta_n)=\frac{S_1-S_3+S_5-S_7+\cdots}{1-S_2+S_4-S_6+\cdots}$$

$$\therefore \tan 5\theta=\frac{{}^5C_1\tan\theta-{}^5C_3\tan^3\theta+{}^5C_5\tan^5\theta}{1-{}^5C_2\tan^2\theta+{}^5C_4\tan^4\theta}$$

5 **(d)**

It is given that a,b,c are in A.P.

$\therefore 2b=a+c$

Now,

$$\frac{\tan\frac{A}{2}+\tan\frac{C}{2}}{\cot\frac{B}{2}}=\left(\tan\frac{A}{2}+\tan\frac{C}{2}\right)\tan\frac{B}{2}$$

$$\Rightarrow \frac{\tan\frac{A}{2}+\tan\frac{C}{2}}{\cot\frac{B}{2}}=\left\{\frac{\Delta}{s(s-a)}+\frac{\Delta}{s(s-c)}\right\}\frac{\Delta}{s(s-b)}$$

$$\Rightarrow \frac{\tan\frac{A}{B}+\tan\frac{C}{2}}{\cot\frac{B}{2}}=\frac{\Delta^2}{s^2(s-b)}\left\{\frac{1}{s-a}+\frac{1}{s-c}\right\}$$

$$\Rightarrow \frac{\tan\frac{A}{2}+\tan\frac{C}{2}}{\cot\frac{B}{2}}=\frac{\Delta^2 b}{s\,\Delta^2}$$

$$\Rightarrow \frac{\tan\frac{A}{2}+\tan\frac{C}{2}}{\cot\frac{B}{2}}=\frac{2b}{2s}=\frac{2b}{a+b+c}=\frac{2b}{3b}=\frac{2}{3}\quad [\because a+c=2b]$$

6 **(c)**

We have,

$$2\frac{\cos A}{a}+\frac{\cos B}{b}+2\frac{\cos C}{c}=\frac{a}{bc}+\frac{b}{ac}$$

$$\Rightarrow 2\left(\frac{b^2+c^2-a^2}{2abc}\right)+\frac{c^2+a^2-b^2}{2abc}+2\left(\frac{a^2+b^2-c^2}{2abc}\right)=\frac{a^2+b^2}{abc}$$

$$\Rightarrow b^2+c^2=a^2\Rightarrow A=\frac{\pi}{2}$$

7 **(d)**

$2^{n-1}\tan(2^{n-1}\alpha)+2^n\cot(2^n\alpha)$

$= 2^{n-1}\left[\frac{\sin 2^{n-1}\alpha}{\cos 2^{n-1}\alpha}+2\frac{\cos 2^n\alpha}{\sin 2^n\alpha}\right]$

$= 2^{n-1}\left[\frac{\cos 2^n\alpha\cos 2^{n-1}\alpha+\sin 2^n\alpha \sin 2^{n-1}\alpha+\cos 2^n\alpha\cos 2^{n-1}\alpha}{\sin 2^n\alpha\cos 2^{n-1}\alpha}\right]$

$= 2^{n-1}\left[\frac{\cos 2^{n-1}\alpha(1+\cos 2^n\alpha)}{\sin 2^n\alpha\cos 2^{n-1}\alpha}\right]$

$= 2^{n-1}\cot 2^{n-1}\alpha$

Proceeding in similar way in last, we get

$\tan\alpha+2\cot 2\alpha$

$=\frac{\sin\alpha}{\cos\alpha}+2\frac{\cos 2\alpha}{\sin 2\alpha}$

$=\frac{\cos 2\alpha\cos\alpha+\sin 2\alpha\sin\alpha+\cos 2\alpha\cos\alpha}{\sin 2\alpha\cos\alpha}$

$=\frac{\cos\alpha(1+\cos 2\alpha)}{2\sin\alpha\cos^2\alpha}$

$=\frac{2\cos^2\alpha}{2\sin\alpha}$

$=\frac{\cos\alpha}{\sin\alpha}=\cot\alpha$

8 **(c)**

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

$=\left[\cos\left(\frac{\pi}{3}-x\right)+\cos\left(\frac{\pi}{3}+x\right)\right]\left[\cos\left(\frac{\pi}{3}-x\right)-\cos\left(\frac{\pi}{3}+x\right)\right]$

$=\left(2\cos\frac{\pi}{3}\cos x\right)\left(2\sin\frac{\pi}{3}\sin x\right)$

$=\sin\frac{2\pi}{3}\sin 2x=\frac{\sqrt{3}}{2}\sin 2x$

Hence, maximum value of given expression is $\frac{\sqrt{3}}{2}$

9 **(d)**

We have,

$\cos C=\frac{a^2+b^2-c^2}{2\,ab}\Rightarrow\cos C=-1\Rightarrow C=\pi$

Which is impossible in a triangle

10 **(c)**

We have,

$\frac{a}{\cos A}=\frac{b}{\cos B}$

$\Rightarrow 2R\sin A\cos B=2R\sin B\cos A$

$\Rightarrow \sin(A-B)=0\Rightarrow A=B$

$\therefore 2\sin A\cos B=\sin 2A=\sin(180°-C)$ [$\because 2A+C=180°$]

$\Rightarrow 2\sin A\cos B=\sin C$

11 **(d)**

Given, $1+\sin\theta+\sin^2\theta+\cdots\infty=4+2\sqrt{3}$

$\Rightarrow \frac{1}{1-\sin\theta}=4+2\sqrt{3}\quad[\because 0<\sin\theta<1]$

$\Rightarrow 1-\sin\theta=\frac{4-2\sqrt{3}}{16-12}=1-\frac{\sqrt{3}}{2}$

$\Rightarrow \sin\theta=\frac{\sqrt{3}}{2}$

$\Rightarrow \theta=\frac{\pi}{3}$ or $\frac{2\pi}{3}$

12 **(c)**

We have,

$a(b^2+c^2)\cos A+b(c^2+a^2)\cos B+c(a^2+b^2)\cos C$

$=(ab^2\cos A+ba^2\cos B)+(ac^2\cos A+ca^2\cos C)+(bc^2\cos B+cb^2\cos C)$

$=ab(b\cos A+a\cos B)+ca(c\cos A+a\cos C)+bc(c\cos B+b\cos C)$

$=abc+abc+abc=3abc$

14 **(a)**

We have, $\tan(\pi\cos\theta)=\tan\left(\frac{\pi}{2}-\pi\sin\theta\right)$

$\therefore \sin\theta+\cos\theta=\frac{1}{2}$

$\Rightarrow \frac{1}{\sqrt{2}}\cos\theta+\frac{1}{\sqrt{2}}\sin\theta=\frac{1}{2\sqrt{2}}$

$\Rightarrow \cos\left(\theta-\frac{\pi}{4}\right)=\frac{1}{2\sqrt{2}}$

15 **(a)**

We have,

$y=5x^2+2x+3$

Clearly, it represents an upward opening parabola having its vertex at $(-1/5, 14/5)$

$\therefore y\ge\frac{14}{5}>2$

Now, $y=2\sin x\le 2$

Thus, the two curves do not intersect. Hence, there is no common point in the two curves

16 **(d)**

We have,

$(a+b+c)(b+c-a)=\lambda\,bc$

$\Rightarrow 2\,s(2s-a)=\lambda\,bc$

$\Rightarrow \frac{s(s-a)}{bc}=\frac{\lambda}{4}$

$\Rightarrow \cos^2\frac{A}{2}=\frac{\lambda}{4}$

$\Rightarrow 0<\frac{\lambda}{4}<1\Rightarrow 0<\lambda<4\quad\left[\because\cos^2\frac{A}{2}\le 1\right]$

17 **(c)**

The given expression can be written as

$(1+\cot^2 A)\cot^2 A-(1+\tan^2 A)\tan^2 A$
$-(\cot^2 A$
$-\tan^2 A)\{(1+\tan^2 A)(1+\cot^2 A)$
$-1\}$
$=\cot^2 A+\cot^4 A-\tan^2 A-\tan^4 A$

$-(\cot^2 A-\tan^2 A)(\cot^2 A+\tan^2 A+1)$
$=\cot^2 A+\cot^4 A-\tan^2 A-\tan^4 A$
$-(\cot^2\ A-\tan^2 A)$
$-(\cot^4 A-\tan^4 A)$
$=0$

13 **(b)**

We have, $2b=a+c$

And,

$\Delta=\frac{3}{5}\times\frac{\sqrt{3}}{4}\left(\frac{a+b+c}{3}\right)^2$

$\Rightarrow \Delta=\frac{3\sqrt{3}}{20}b^2$

$\Rightarrow s(s-a)(s-b)(s-c)=\frac{27}{400}b^4$

$\Rightarrow \left(\frac{a+b+c}{2}\right)\left(\frac{b+c-a}{2}\right)\left(\frac{c+a-b}{2}\right)\left(\frac{a+b-c}{2}\right)=\frac{27}{400}b^4$

$\Rightarrow \left(\frac{3b}{2}\right)\times\left(\frac{b+c-2b+c}{2}\right)\left(\frac{b}{2}\right)\left(\frac{2b-c+b-c}{2}\right)=\frac{27}{400}b^4$

$[\because 2b=a+c]$

$\Rightarrow \frac{3b}{2}\times\left(\frac{2c-b}{2}\right)\times\frac{b}{2}\times\left(\frac{3b-2c}{2}\right)=\frac{27}{400}b^4$

$\Rightarrow (2c-b)(3b-2c)=\frac{9b^2}{25}$

$\Rightarrow (6bc-4c^2-3b^2+2bc)=\frac{9b^2}{25}$

$\Rightarrow 8bc-4c^2-3b^2=\frac{9b^2}{25}$

$\Rightarrow \frac{84}{25}b^2-8\,bc+4c^2=0$

$\Rightarrow 21b^2-50bc+25c^2=0$

$\Rightarrow (7b-5c)(3b-5c)=0$

$\Rightarrow 7b=5c$ or, $3b=5c\Rightarrow \frac{b}{c}=\frac{5}{7},\frac{5}{3}$

Now,

$2b=a+c\Rightarrow \frac{2b}{c}=\frac{a}{c}+1\Rightarrow \frac{a}{c}=\frac{3}{7},\frac{7}{3}$

Hence, $a:b:c=3:5:7$

18 **(a)**

$$\sqrt{\frac{a+b}{a-b}}-\sqrt{\frac{a-b}{a+b}}$$

$$=\sqrt{\frac{1+\frac{b}{a}}{1-\frac{b}{a}}}-\sqrt{\frac{1-\frac{b}{a}}{1+\frac{b}{a}}}$$

$$=\sqrt{\frac{1+\tan\alpha}{1-\tan\alpha}}-\sqrt{\frac{1-\tan\alpha}{1+\tan\alpha}}$$

$$=\frac{(1+\tan\alpha)-(1-\tan\alpha)}{\sqrt{1-\tan^2\alpha}}$$

$$=\frac{2\tan\alpha}{\sqrt{1-\tan^2\alpha}}=\frac{2\sin\alpha}{\sqrt{\cos 2\alpha}}$$

19 **(b)**

Since, $\sin\theta+\cos\theta=x$ ...(i)

and $\sin^6\theta+\cos^6\theta=\frac{1}{4}[4-3(x^2-1)^2]$

On equation Eq (i), we get

$\sin 2\theta=x^2-1\leq 1 \quad (\because \sin 2\theta\leq 1)$

$\Rightarrow x^2\leq 2\Rightarrow -\sqrt{2}\leq x\leq\sqrt{2}$

Now, $\sin^6\theta+\cos^6\theta = (\sin^2\theta+\cos^2\theta)^3-3\sin^2\theta\cos^2\theta(\sin^2\theta+\cos^2\theta)$

$$=1-3\sin^2\theta\cos^2\theta=1-\frac{3}{4}\sin^2 2\theta$$

$$=1-\frac{3}{4}(x^2-)^2=\frac{1}{4}[4-3(x^2-1)^2]$$

Thus, the given result will hold true only when $x^2\leq 2$ and not for all real values of x

20 **(b)**

We have,

$$\frac{\sin A}{\sin C}=\frac{\sin(A-B)}{\sin(B-C)}$$

$\Rightarrow \sin(B+C)\sin(B-C)=\sin(A+B)\sin(A-B)$

$\Rightarrow \sin^2 B-\sin^2 C=\sin^2 A-\sin^2 B$

$\Rightarrow b^2-c^2=a^2-b^2\Rightarrow a^2,b^2,c^2$ are in A.P.

ANSWER-KEY										
Q.	1	2	3	4	5	6	7	8	9	10
A.	C	A	A	A	D	C	D	C	D	C
Q.	11	12	13	14	15	16	17	18	19	20
A.	D	C	A	A	D	C	B	A	B	B

SESSION : 2025-26

DPP
DAILY PRACTICE PROBLEMS

Class : XIth
Date :

Solutions

Subject : MATHS
DPP No. :3

Topic :-TRIGONOMETRIC FUNCTIONS

1 **(a)**

It is given that A, B, C are in A.P.

$\therefore 2B = A + C \Rightarrow 3B = A + B + C \Rightarrow 3B = 180° \Rightarrow B = 60°$

$\Rightarrow \cos B = \dfrac{1}{2}$

$\Rightarrow \dfrac{c^2 + a^2 - b^2}{2ac} = \dfrac{1}{2}$

$\Rightarrow c^2 + a^2 - b^2 = ac$

$\Rightarrow (a - c)^2 = b^2 - ac$

$\Rightarrow |a - c| = \sqrt{b^2 - ac}$

$\Rightarrow |\sin A - \sin C| = \sqrt{\sin^2 B - \sin A \sin C}$

$\Rightarrow 2\left|\sin \dfrac{A - C}{2}\right| \cos \dfrac{A + C}{2} = \sqrt{\dfrac{3}{4} - \sin A \sin C}$

$\Rightarrow 2\left|\sin \dfrac{A - C}{2}\right| = \sqrt{3 - 4 \sin A \sin C}$

$\Rightarrow \dfrac{\sqrt{3 - 4\sin A \sin C}}{|A - C|} = \dfrac{2\left|\sin \frac{A-C}{2}\right|}{|A - C|}$

$\Rightarrow \lim\limits_{A \to C} \dfrac{\sqrt{3 - 4 \sin A \sin C}}{|A - C|} = \lim\limits_{A \to C} \left| \dfrac{\sin\left(\frac{A-C}{2}\right)}{\frac{A-C}{2}} \right| = 1$

2 **(c)**

$3 - \cos\theta + \cos\left(\theta + \dfrac{\pi}{3}\right)$

$= 3 - \cos\theta + \dfrac{1}{2}\cos\theta - \dfrac{\sqrt{3}}{2}\sin\theta$

$= 3 - \dfrac{1}{2}\cos\theta - \dfrac{\sqrt{3}}{2}\sin\theta = 3 - \sin\left(\theta + \dfrac{\pi}{6}\right)$

Since, $-1 \le \sin\theta \le 1$

Hence, the value of expression lies in [2, 4]

3 **(c)**

We have, $\cos A = m \cos B$

$$\Rightarrow \frac{\cos A}{\cos B} = \frac{m}{1}$$

$$\Rightarrow \frac{\cos A + \cos B}{\cos A - \cos B} = \frac{m+1}{m-1}$$

$$\Rightarrow \frac{2\cos\frac{A+B}{2}\cos\frac{B-A}{2}}{2\sin\frac{A+B}{2}\sin\frac{B-A}{2}} = \frac{m+1}{m-1}$$

$$\Rightarrow \cot\frac{A+B}{2} = \left(\frac{m+1}{m-1}\right)\tan\frac{B-A}{2}$$

But $\cot\frac{A+B}{2} = \lambda \tan\frac{B-A}{2}$

$$\therefore\ \lambda = \frac{m+1}{m-1}$$

4 **(c)**

$$\cos^4\frac{\pi}{8} + \cos^4\frac{7\pi}{8} + \cos^4\frac{3\pi}{8} + \cos^4\frac{5\pi}{8}$$
$$= \cos^4\frac{\pi}{8} + \cos^4\frac{\pi}{8} + \cos^4\left(\frac{\pi}{2} - \frac{\pi}{8}\right) + \cos^4\left(\frac{\pi}{2} + \frac{\pi}{8}\right)$$
$$= 2\left[\cos^4\frac{\pi}{8} + \sin^4\frac{\pi}{8}\right]$$
$$= 2\left[\left(\cos^2\frac{\pi}{8} + \sin^2\frac{\pi}{8}\right)^2 - 2\sin^2\frac{\pi}{8}\cos^2\frac{\pi}{8}\right]$$
$$= 2\left[1 - \frac{1}{2}\left(\sin\frac{\pi}{4}\right)^2\right]$$
$$= 2\left[1 - \frac{1}{4}\right] = \frac{3}{2}$$

5 **(b)**

Given, $\sin\theta = \frac{12}{13}$ and $\cos\phi = -\frac{3}{5}$

$\therefore\ \cos\theta = \frac{5}{13}$ and $\sin\phi = -\frac{4}{5}$

$\therefore\ \sin(\theta + \phi) = \sin\theta\cos\phi + \cos\theta\sin\phi$

$$= \frac{12}{13} \times \left(-\frac{3}{5}\right) + \frac{5}{13} \times \left(-\frac{4}{5}\right)$$
$$= \frac{-36}{65} + \frac{(-20)}{65} = -\frac{56}{65}$$

6 **(c)**

We have,

$$\sec^2\theta\,\mathrm{cosec}^2\theta = \frac{\sin^2\theta + \cos^2\theta}{\sin^2\theta\cos^2\theta} - \frac{4}{\sin^2 2\theta} \geq 4$$

and, $\sec^2\theta\,\mathrm{cosec}^2\theta = \frac{4}{\sin^2 2\theta} \geq 4$

Thus, the required equation is

$x^2 - \lambda x + \lambda = 0$, where $\lambda \geq 4$

7 **(a)**

$$\frac{1}{m}\left[(m+n) + \frac{1}{(m+n)}\right]$$

$$= \frac{1}{\sec\theta}\left[\sec\theta + \tan\theta + \frac{1}{\sec\theta + \tan\theta}\right]$$

$$= \frac{[\sec^2\theta + \tan^2\theta + 2\sec\theta\tan\theta + 1]}{\sec\theta(\sec\theta + \tan\theta)}$$

$$= \frac{2\sec^2\theta + 2\sec\theta\tan\theta}{\sec\theta(\sec\theta + \tan\theta)}$$

$= 2$

8 **(a)**

$\because \sin A \sin B = \frac{1}{2} \times\ 2\sin A \sin B$

$= \frac{1}{2}[\cos(A - B) - \cos(A + B)]$

$= \frac{1}{2}[\cos(A - B) - \cos 90°]$ $(\because A + B + C = 180°$ and $\angle C = 90°$, given$)$

$= \frac{1}{2}\cos(A - B) \leq \frac{1}{2}$

$\therefore$ Maximum value of $\sin A \sin B = \frac{1}{2}$

9 **(b)**

In cyclic quadrilateral $ABCD$, we have

$A + C = \pi$ and $B + D = \pi$

$\therefore \cos A = -\cos C$ and $\cos B = -\cos D$

$\Rightarrow \cos A + \cos B + \cos C + \cos D = 0$

10 **(d)**

Let $A = \theta, B = 2\,\theta$ and $C = 3\,\theta$. Then,

$A + B + C = 180° \Rightarrow 6\,\theta = 180° \Rightarrow \theta = 30°$

$\therefore A = 30°, B = 60°$ and $C = 90°$

Now,

$a : b : c = \sin A : \sin B : \sin C$,

$\Rightarrow a : b : c = \frac{1}{2} : \frac{\sqrt{3}}{2} : 1 \Rightarrow a : b : c = 1 : \sqrt{3} : 2$

11 **(b)**

We have,

$\sin(\pi\cos\theta) = \cos(\pi\sin\theta)$

$$\Rightarrow \sin(\pi\cos\theta) = \sin\left(\frac{\pi}{2} + \pi\sin\theta\right)$$
$$\Rightarrow \pi\cos\theta = \frac{\pi}{2} + \pi\sin\theta$$
$$\Rightarrow \pi\cos\theta - \pi\sin\theta = \frac{\pi}{2}$$
$$\Rightarrow \cos\theta - \sin\theta = \frac{1}{2}$$
$$\Rightarrow \frac{1}{\sqrt{2}}\cos\theta - \frac{1}{\sqrt{2}}\sin\theta = \frac{1}{2\sqrt{2}} \Rightarrow \cos\left(\theta + \frac{\pi}{4}\right) = \frac{1}{2\sqrt{2}}$$

12 **(a)**

The given equation is not meaningful for

$|\cos x| = 1$

So, let $|\cos x| \neq 1$

Now,

$$2^{1+|\cos x|+\cos^2 x+|\cos x|^3+\cdots+\text{to }\infty} = 4$$
$$\Rightarrow \frac{1}{2^{1-|\cos x|}} = 2^2$$
$$\Rightarrow \frac{1}{1-|\cos x|} = 2$$
$$\Rightarrow 2 - 2|\cos x| = 1$$
$$\Rightarrow |\cos x| = \frac{1}{2}$$
$$\Rightarrow \cos x = \pm\frac{1}{2}$$
$$\Rightarrow \cos x = \cos\frac{\pi}{3}, \cos x = \cos\frac{2\pi}{3}$$
$$\Rightarrow x = 2n\pi \pm \frac{\pi}{3}, x = 2n\pi \pm \frac{2\pi}{3}, n \in Z$$
$$\Rightarrow x = 2n\pi \pm \frac{\pi}{3}, x = (2n \pm 1)\pi \pm \frac{\pi}{3}$$
$$\Rightarrow x = n\pi \pm \frac{\pi}{3}, n \in Z$$

13 **(b)**

We have,

$$(\cos\alpha + \cos\beta)^2 - (\sin\alpha + \sin\beta)^2 = 0$$
$$\Rightarrow (\cos^2\alpha + \cos^2\beta + 2\cos\alpha\cos\beta) - (\sin^2\alpha + \sin^2\beta + 2\sin\alpha\sin\beta) = 0$$
$$\Rightarrow \cos 2\alpha + \cos 2\beta = -2(\cos\alpha\cos\beta - \sin\alpha\sin\beta)$$
$$\Rightarrow \cos 2\alpha + \cos 2\beta = -2\cos(\alpha + \beta)$$

14 **(d)**

The given expression can be written as $\frac{1+\cos y-\sin^2 y}{1+\cos y} + \frac{(1-\cos^2 y)-\sin^2 y}{\sin y(1-\cos y)}$

$$= \frac{\cos y\,(1+\cos y)}{1+\cos y} + 0 = \cos y$$

15 **(a)**

We have,

$a = 2b$

$\Rightarrow 2R \sin A = 4R \sin B$

$\Rightarrow \sin A = 2 \sin B$

$\Rightarrow \sin 3B = 2 \sin B \quad [\because A = 3B]$

$\Rightarrow 3 \sin B - 4 \sin^3 B = 2 \sin B$

$\Rightarrow \sin B - 4 \sin^3 B = 0$

$\Rightarrow 1 - 4 \sin^2 B = 0 \Rightarrow \sin B = \dfrac{1}{2} \Rightarrow B = \dfrac{\pi}{6}$

$\therefore A = 3B = \dfrac{\pi}{2}$

16 **(b)**

We know that

$AD^2 = \dfrac{1}{4}(b^2 + c^2 + 2bc \cos A)$

$\therefore 4AD^2 = b^2 + c^2 + 2bc \cos\dfrac{\pi}{3} \Rightarrow 4AD^2 = b^2 + c^2 + bc$

17 **(a)**

We know that,

$\alpha - \beta = (\theta - \beta) - (\theta - \alpha)$

$\therefore \cos(\alpha - \beta) = \cos(\theta - \beta)\cos(\theta - \alpha) + \sin(\theta - \beta)\sin(\theta - \alpha)$

$= ab + \sqrt{1 - a^2}\sqrt{1 - b^2}$

and $\sin(\alpha - \beta) = \pm(a\sqrt{1 - b^2} - b\sqrt{1 - a^2})$

$\Rightarrow \sin^2(\alpha - \beta) = a^2 + b^2 - 2a^2b^2 - 2ab\sqrt{1 - a^2}\,\sqrt{1 - b^2}$

$\Rightarrow \sin^2(\alpha - \beta) = a^2 + b^2 - 2a^2b^2 - 2ab[\cos(\alpha - \beta) - ab]$

$\therefore \sin^2(\alpha - \beta) - a^2 + b^2 - 2ab \cos(\alpha - \beta)$

$\Rightarrow \sin^2(\alpha - \beta) + 2ab \cos(\alpha - \beta) = a^2 + b^2$

18 **(b)**

$\dfrac{1}{2}\tan\dfrac{x}{2} = \dfrac{1}{2}\cot\dfrac{x}{2} - \cot x \qquad \left[\because \cot x = \dfrac{1 - \tan^2\frac{x}{2}}{2\tan\frac{x}{2}}\right]$

And $\frac{1}{2^2}\tan\frac{x}{2^2} = \frac{1}{2^2}\cot\left(\frac{x}{2^2}\right) - \frac{1}{2}\cot\left(\frac{x}{2}\right)$

Similarly, $\frac{1}{2^3}\tan\left(\frac{x}{2^3}\right) = \frac{1}{2^3}\cot\left(\frac{x}{2^3}\right) - \frac{1}{2^2}\cot \ldots \left(\frac{x}{2^2}\right)$

$\vdots \quad \vdots \qquad \vdots \quad \vdots \qquad \vdots$

$\dfrac{1}{2^n}\tan\left(\dfrac{x}{2^n}\right) = \dfrac{1}{2^n}\cot\left(\dfrac{x}{2^n}\right) - \dfrac{1}{2^{n-1}}\cot\left(\dfrac{x}{2^{n-1}}\right)$

Om adding all the above results, we get

$$\frac{1}{2}\tan\frac{x}{2}+\frac{1}{2^2}\tan\left(\frac{x}{2^2}\right)+\ldots+\frac{1}{2^n}\tan\left(\frac{x}{2^n}\right)=\frac{1}{2^n}\cot\left(\frac{x}{2^n}\right)-\cot x$$

19 **(c)**

It is given that

Area of ΔABC = Area of ΔDEF

$\Rightarrow \frac{1}{2}AB\cdot AC\sin A=\frac{1}{2}\,CE\cdot EF\sin E$

$\Rightarrow \sin A=\sin E$

$\Rightarrow \sin 2E=\sin E$

$\Rightarrow 2E=\pi-E\Rightarrow E=\frac{\pi}{3}\Rightarrow A=2E=\frac{2\,\pi}{3}$

20 **(c)**

We have,

$\sin\frac{\pi}{18}\sin\frac{5\pi}{18}\sin\frac{7\pi}{18}$

$=\cos\left(\frac{\pi}{2}-\frac{\pi}{18}\right)\cos\left(\frac{\pi}{2}-\frac{5\pi}{18}\right)\cos\left(\frac{\pi}{2}-\frac{7\pi}{18}\right)$

$=\cos\frac{8\pi}{18}\cos\frac{4\pi}{18}\cos\frac{2\pi}{8}$

$=\cos\frac{\pi}{9}\cos\frac{2\pi}{9}\cos\frac{4\pi}{9}=\frac{\sin(2^3.\pi/9)}{2^3\sin\pi/9}=\frac{1}{2^3}=\frac{1}{8}$

ANSWER-KEY										
Q.	1	2	3	4	5	6	7	8	9	10
A.	A	C	C	C	B	C	A	A	B	D
Q.	11	12	13	14	15	16	17	18	19	20
A.	B	A	B	D	A	B	A	B	C	C

SESSION : 2025-26

DPP

DAILY PRACTICE PRACTICE PROBLEMS

Class : XIth
Date :

Solutions

Subject : MATHS
DPP No. :4

Topic :-TRIGONOMETRIC FUNCTIONS

1 **(c)**

We have,

$a = \sin^4\theta + \cos^4\theta \leq \sin^2\theta + \cos^2\theta \leq 1$

Also,

$a = \sin^4\theta + \cos^4\theta = (\sin^2\theta + \cos^2\theta)^2 - 2\sin^2\theta + \cos^2\theta$

$\Rightarrow a = \sin^4\theta + \cos^4\theta = 1 - \frac{1}{2}\sin^2 2\theta$

$\Rightarrow \sin^2 2\theta = 2(1-a) \Rightarrow 2(1-a) \leq 1 \Rightarrow a \geq \frac{1}{2}$

Hence, $\frac{1}{2} \leq a \leq 1$

2 **(a)**

Let $\sqrt{3}+1 = r\cos\alpha$ and $\sqrt{3}-1 = r\sin\alpha$, then

$r = \sqrt{(\sqrt{3}+1)^2 + (\sqrt{3}-1)^2}$

$= \sqrt{3+1+2\sqrt{3}+3+1-2\sqrt{3}} = 2\sqrt{2}$

and $\tan\alpha = \frac{\sqrt{3}-1}{\sqrt{3}+1} = \frac{1-\left(\frac{1}{\sqrt{3}}\right)}{1+\left(\frac{1}{\sqrt{3}}\right)} = \tan\left(\frac{\pi}{4} - \frac{\pi}{6}\right)$

$\Rightarrow \alpha = \frac{\pi}{12}$

The given equation reduces to

$2\sqrt{2}\cos(\theta - \alpha) = 2$

$\Rightarrow \cos\left(\theta - \frac{\pi}{12}\right) = \cos\frac{\pi}{4}$

$\Rightarrow \theta - \frac{\pi}{12} = 2n\pi \pm \frac{\pi}{4}$

$\Rightarrow \theta = 2n\pi \pm \frac{\pi}{4} + \frac{\pi}{12}$

3 **(d)**

$\sin(A+B) = \sin A\cos B + \sin B\cos A$

$= \frac{1}{\sqrt{10}} . \sqrt{1-\frac{1}{5}} + \frac{1}{\sqrt{5}}\sqrt{1-\frac{1}{10}}$

$\left[\because \sin A = \frac{1}{\sqrt{10}}, \sin B = \frac{1}{\sqrt{5}}\right]$

$= \frac{1}{\sqrt{10}}\sqrt{\frac{4}{5}} + \frac{1}{\sqrt{5}}\sqrt{\frac{9}{10}} = \frac{5}{\sqrt{50}} = \frac{1}{\sqrt{2}} = \sin\frac{\pi}{4}$

$\Rightarrow \; A + B = \frac{\pi}{4}$

4 **(b)**

The given equation can be rewritten as

$\tan\theta(\sin\theta + \sqrt{3}) = 0$

$\Rightarrow \tan\theta = 0$, but $\sin\theta + \sqrt{3} \neq 0$

$\Rightarrow \tan\theta = 0 \Rightarrow \; \theta = n\pi, n \in I$

5 **(a)**

We have, $y = \sin\theta - \cos\theta$ and $\sin\theta - \cos\theta$ lies between $-\sqrt{2}$ and $+\sqrt{2}$

$\therefore -\sqrt{2} \leq y \leq \sqrt{2}$

6 **(c)**

Now, $\sin(\alpha - \beta) = \sin(\theta - \beta - (\theta - \alpha))$

$= \sin(\theta - \beta) = \cos(\theta - \alpha) - \cos(\theta - \beta)\sin(\theta - \alpha)$

$= ba - \sqrt{1 - b^2}\sqrt{1 - a^2}$

and $\cos(\alpha - \beta) = \cos(\theta - \beta - (\theta - \alpha))$

$= \cos(\theta - \beta)\cos(\theta - \alpha) + \sin(\theta - \beta)\sin(\theta - \alpha)$

$= a\sqrt{1 - b^2} + b\sqrt{1 - a^2}$

$\therefore \cos^2(\alpha - \beta) + 2ab\sin(\alpha - \beta)$

$= \left(a\sqrt{1 - b^2} + b\sqrt{1 - a^2}\right)^2 + 2ab\left(ab - \sqrt{1 - a^2}\sqrt{1 - b^2}\right)$

$= a^2 + b^2$

7 **(d)**

We have,

$8\sec^2\theta - 6\sec\theta + 1 = 0$

$\Rightarrow (4\sec\theta - 1)(2\sec\theta - 1) = 0$

$\Rightarrow \sec\theta = \frac{1}{4}, \sec\theta = \frac{1}{2}$

But, this is not possible as $|\sec\theta| \geq 1$

8 **(c)**

We have,

$x^3 - 13x^2 + 54x - 72 = 0$

$\Rightarrow (x - 3)(x^2 - 10x + 24) = 0$

$\Rightarrow (x-3)(x-4)(x-6)=0 \Rightarrow x=3,4,6$

Let $a=3, b=4$ and $c=6$

$\therefore \frac{\cos A}{a}+\frac{\cos B}{b}+\frac{\cos C}{c}=\frac{a^2+b^2+c^2}{2abc}=\frac{61}{144}$

9 **(b)**

$\cos^4\theta-\sin^4\theta=(\cos^2\theta-\sin^2\theta)(\cos^2\theta+\sin^2\theta)$

$=\cos 2\theta=2\cos^2\theta-1$

10 **(b)**

$\cos 15° \cos 7\frac{1}{2}° \sin 7\frac{1}{2}°$

$=\frac{1}{2}\cos 15° \sin 15° = \frac{1}{4}\sin 30°$

$=\frac{1}{4}\times\frac{1}{2}=\frac{1}{8}$

11 **(b)**

$\sqrt{\frac{1-\sin\theta}{1+\sin\theta}}+\sqrt{\frac{1+\sin\theta}{1-\sin\theta}}=\frac{1-\sin\theta+1+\sin\theta}{\sqrt{1-\sin^2\theta}}$

$=\frac{2}{\sqrt{\cos^2\theta}}=\frac{2}{|\cos\theta|}$

$=-\frac{2}{\cos\theta}=-2\sec\theta\left(\because \frac{\pi}{2}<\theta<\pi\right)$

12 **(c)**

$\cos^2 A(3-4\cos^2 A)^2+\sin^2 A(3-4\sin^2 A)^2$

$=(3\cos A-4\cos^3 A)^2+(3\sin A-4\sin^3 A)^2$

$=(-\cos 3A)^2+(\sin 3A)^2=1$

13 **(a)**

It is given that A, B, C are in A.P.

$\therefore 2B=A+C$

$\Rightarrow 3B=A+B+C \Rightarrow 3B=180° \Rightarrow B=60°$

Also,

$b:c=\sqrt{3}:\sqrt{2}$

$\Rightarrow \frac{\sin B}{\sin C}=\frac{\sqrt{3}}{\sqrt{2}}$

$\Rightarrow \frac{\sqrt{3}}{2\sin C}=\frac{\sqrt{3}}{\sqrt{2}} \Rightarrow \sin C=\frac{1}{\sqrt{2}} \Rightarrow C=45°$

$\therefore A=180°-(60°+45°)=75°$

14 **(b)**

We have, $\tan x=\frac{b}{a}$

$$\therefore \sqrt{\frac{a+b}{a-b}}+\sqrt{\frac{a-b}{a+b}}$$
$$=\sqrt{\frac{1+\frac{b}{a}}{1-\frac{b}{a}}}+\sqrt{\frac{1-\frac{b}{a}}{1+\frac{b}{a}}}$$
$$=\sqrt{\frac{1+\tan x}{1-\tan x}}+\sqrt{\frac{1-\tan x}{1+\tan x}}$$
$$=\sqrt{\frac{\cos x+\sin x}{\cos x-\sin x}}+\sqrt{\frac{\cos x-\sin x}{\cos x+\sin x}}$$
$$=\frac{\cos x+\sin x+\cos x-\sin x}{\sqrt{\cos^2 x-\sin^2 x}}=\frac{2\cos x}{\sqrt{\cos 2x}}$$

15 **(c)**

We have,

$\sin A+\cos A=m$ and $\sin^3 A+\cos^3 A=n$

Now, $\sin A+\cos A=m$

$\Rightarrow (\sin A+\cos A)^3=m^3$

$\Rightarrow \sin^3 A+\cos^3 A+3\sin A\cos A\,(\sin A+\cos A)=m^3$

$\Rightarrow n+3\sin A\cos A\;m=m^3$ ...(i)

Again,

$\sin A+\cos A=m$

$\Rightarrow \sin^2 A+\cos^2 A+2\sin A\cos A=m^2$

$\Rightarrow \sin A\cos A=\frac{m^2-1}{2}$ ...(ii)

From (i) and (ii), we have

$$n+3m\frac{(m^2-1)}{2}=m^3$$

$\Rightarrow 2n+3m^3-3m=2m^3\Rightarrow m^3-3m+2n=0$

16 **(b)**

$\because\ \sec x-1=\left(\sqrt{2}-1\right)\tan x$

$\Rightarrow\ 1-\cos x=\left(\sqrt{2}-1\right)\sin x$

$\Rightarrow\ \sin\frac{x}{2}\left\{\sin\frac{x}{2}-\left(\sqrt{2}-1\right)\cos\frac{x}{2}\right\}=0$

$\Rightarrow \sin\frac{x}{2}=0$ or $\tan\frac{x}{2}=\sqrt{2}-1=\tan\frac{\pi}{8}$

$\Rightarrow \frac{x}{2}=n\pi$ or $\frac{x}{2}=n\pi+\frac{\pi}{8}$

$\therefore\ x=2n\pi, 2n\pi+\frac{\pi}{4}$

17 **(a)**

$\alpha-\beta=(\theta-\beta)-(\theta-\alpha)$

$\therefore\ \cos(\alpha-\beta)=\cos(\theta-\beta)\cos(\theta-\alpha)+\sin(\theta-\beta)\sin(\theta-\alpha)$

And $\sin(\alpha-\beta)=\sin(\theta-\beta)\cos(\theta-\alpha)-\sin(\theta-\alpha)\cos(\theta-\beta)$

$\Rightarrow \cos(\alpha-\beta) = b.a + \sqrt{1-a^2}\sqrt{1-b^2}$

And $\sin(\alpha-\beta) = \left(a\sqrt{1-b^2}\right) - \left(b\sqrt{1-b^2}\right)$

Now, $\sin^2(\alpha-\beta) = \left(a\sqrt{1-b^2}\right)^2 + \left(b\sqrt{1-b^2}\right)^2 - 2ab\sqrt{1-a^2}\sqrt{1-b^2}$

$\Rightarrow \sin^2(\alpha-\beta) = a^2(1-b^2) + b^2(1-a^2) - 2ab\{\cos(\alpha-\beta) - ab\}$

$\Rightarrow \sin^2(\alpha-\beta) + 2ab\cos(\alpha-\beta) = a^2 - a^2b^2 + b^2 - b^2a^2 + 2a^2b^2$

$\Rightarrow \sin^2(\alpha-\beta) + 2ab\cos(\alpha-\beta) = a^2 + b^2$

18 **(a)**

We have, $S = \sin\theta + \sin 2\theta + \sin 3\theta + \ldots + \sin n\theta$

We know that,

$\sin\theta + \sin(\theta+\beta) + \sin(\theta+2\beta) + \ldots n$ terms

$$= \frac{\sin\frac{n\beta}{2}}{\sin\frac{\beta}{2}} \sin\left[\frac{\theta+\theta+(n-1)\beta}{2}\right]$$

Put, $\beta = \theta$

$$\therefore S = \frac{\sin\frac{n\theta}{2}\cdot\sin\frac{(n+1)\theta}{2}}{\sin\frac{\theta}{2}}$$

19 **(c)**

Given, $\frac{\tan 3\theta - 1}{\tan 3\theta + 1} = \sqrt{3}$

$\Rightarrow \tan 3\theta - 1 - \sqrt{3}\tan 3\theta - \sqrt{3} = 0$

$$\Rightarrow \tan 3\theta = \frac{1+\sqrt{3}}{1-\sqrt{3}} = \tan(45° + 60°)$$

$$\Rightarrow \tan 3\theta = \tan\frac{7\pi}{12}$$

$$\Rightarrow 3\theta = n\pi + \frac{7\pi}{12}$$

$$\Rightarrow \theta = \frac{n\pi}{3} + \frac{7\pi}{12}$$

ANSWER-KEY										
Q.	1	2	3	4	5	6	7	8	9	10
A.	C	A	D	B	A	C	D	C	B	B
Q.	11	12	13	14	15	16	17	18	19	20
A.	B	C	A	B	C	B	A	A	C	C

SESSION : 2025-26

DPP
DAILY PRACTICE PROBLEMS

Class : XIth

Date :

Solutions

Subject : MATHS

DPP No. :5

Topic :-TRIGONOMETRIC FUNCTIONS

1 **(a)**

We have,

$2\sin\theta = r^4 - 2r^2 + 3$

$\Rightarrow 2\sin\theta = (r^2-1)^2 + 2$

Clearly, LHS ≤ 2 and RHS ≥ 2

So, the equation is meaningful if each side is equal to 2

Clearly, RHS $= 2$ for $r^2 = 1$

For $r^2 = 1$, we have

$2\sin\theta = 2$

$\Rightarrow \sin\theta = 1 \Rightarrow \theta = \frac{\pi}{2}, \frac{5\pi}{2}, \frac{9\pi}{2}$ $\quad [\because 0 \leq \theta \leq 5\pi]$

Also, $r^2 = 1 \Rightarrow r = \pm 1$

Hence, the total number of pairs of the form (r, θ) is $2 \times 3 = 6$

2 **(a)**

We have,

$\frac{1}{p_1^2} + \frac{1}{p_2^2} + \frac{1}{p_3^2} = \frac{a^2+b^2+c^2}{4\Delta^2}$

Also,

$\cot A + \cos B + \cot C = \frac{2R}{abc}\,(b^2+c^2-a^2+c^2+a^2-b^2+a^2+b^2-c^2)$

$\Rightarrow \cot A + \cos B + \cot C = \frac{R(a^2+b^2+c^2)}{abc} = \frac{a^2+b^2+c^2}{4\Delta}$

Hence, $\frac{1}{p_1^2} + \frac{1}{p_2^2} + \frac{1}{p_3^2} = \frac{\cot A + \cot B + \cot C}{\Delta}$

3 **(c)**

We have,

$\sin 2\theta + 2 = 4\sin\theta + \cos\theta$

$\Rightarrow 2\sin\theta\cos\theta - \cos\theta + 2 - 4\sin\theta = 0$

$\Rightarrow \cos\theta(2\sin\theta - 1) - 2(2\sin\theta - 1) = 0$

$\Rightarrow (2\sin\theta - 1)(\cos\theta - 2) = 0$

$\Rightarrow 2\sin\theta - 1 = 0 \qquad [\because \cos\theta - 2 \neq 0]$

$\Rightarrow \sin\theta = \frac{1}{2}$

$\Rightarrow \theta = 2\pi + \frac{\pi}{6}, 2\pi + \frac{5\pi}{6}, 4\pi + \frac{\pi}{6}, 4\pi + \frac{5\pi}{6}$

Hence, the equation has 4 solutions

ALITER The curves $y = \sin x$ and $y = \frac{1}{2}$ intersect at 4 points in $[\pi, 5\pi]$. So, the equation has 4 solutions

4 **(c)**

For a triangle inscribed in a circle, we have

$\frac{a}{2\sin A} = \frac{b}{2\sin B} = \frac{c}{2\sin C} = R$

$\therefore \sin^2 A + \sin^2 B + \sin^2 C$

$= \frac{a^2}{4R^2} + \frac{b^2}{4R^2} + \frac{c^2}{4R^2}(a^2 + b^2 + c^2)$

It is given that

$\frac{a^2 + b^2 + c^2}{2} = 2(2R)^2 \Rightarrow a^2 + b^2 + c^2 = 16R^2$

$\therefore \sin^2 A + \sin^2 B + \sin^2 C = \frac{1}{4R^2}(16R^2) = 4$

5 **(d)**

We have,

$\tan 9° - \tan 27° - \tan 63° + \tan 81°$

$= (\tan 9° + \tan 81°) - (\tan 27° + \tan 63°)$

$= (\tan 9° + \cot 9°) - (\tan 27° + \cot 27°)$

$= \frac{1}{\sin 9° \cos 9°} - \frac{1}{\sin 27° \cos 27°}$

$= \frac{2}{\sin 18°} - \frac{2}{\sin 54°}$

$= 2\frac{\sin 54° - \sin 18°}{\sin 54° \sin 18°} = 2\frac{\cos 36° - \sin 18°}{\sin 18° \cos 36°} = 4$

6 **(c)**

Given, $\sin 4A + \sin 2A = \cos 4A + \cos 2A$

$\Rightarrow \quad 2\sin 3A \cos A = 2\cos 3A \cos A$

$\therefore \quad \tan 3A = 1 \text{ and } \cos A = 0$

$\Rightarrow \quad A = \frac{\pi}{12} \text{ and } A = \frac{\pi}{2} \notin \left(0, \frac{\pi}{4}\right)$

$\therefore \tan 4A = \tan\frac{\pi}{3} = \sqrt{3}$

7 **(c)**

We have,

$\sin A + \sin B = \frac{a+b}{c}$

$\Rightarrow \sin A + \sin B = \frac{\sin A + \sin B}{\sin C} \Rightarrow \sin C = 1$

8 **(a)**

We have,

$\sin(\alpha+\beta)=1, \sin(\alpha-\beta)=\frac{1}{2}$

$\Rightarrow \alpha+\beta=\frac{\pi}{2}$ and, $\alpha-\beta=\frac{\pi}{6}$

$\Rightarrow \alpha=\frac{\pi}{3}, \beta=\frac{\pi}{6}$

$\therefore \tan(\alpha+2\beta)\tan(2\alpha+\beta)$

$=\tan\left(\frac{2\pi}{3}\right)\tan\frac{5\pi}{6}=\left(-\cot\frac{\pi}{6}\right)\left(-\cot\frac{\pi}{3}\right)=1$

9 **(c)**

Let $a_0=\cos\theta$. Then,

$$a_1=\sqrt{\frac{1}{2}(1+a_0)}=\sqrt{\frac{1}{2}(1+\cos\theta)}=\cos\frac{\theta}{2}$$

$$a_2=\sqrt{\frac{1}{2}(1+a_1)}=\sqrt{\frac{1}{2}\left(1+\cos\frac{\theta}{2}\right)}=\cos\left(\frac{\theta}{2^2}\right)$$

and so on

Now, $\frac{1-a_0^2}{a_1a_2a_3\ldots\text{to }\infty}$

$$=\frac{\sin\theta}{\cos\frac{\theta}{2}\cos\frac{\theta}{2^2}\cos\frac{\theta}{2^3}\ldots\text{to }\infty}$$

$$=\lim_{n\to\infty}\frac{\sin\theta}{\cos\frac{\theta}{2}\cos\frac{\theta}{2^2}\cos\frac{\theta}{2^3}\ldots\text{to }\infty}$$

$$=\lim_{n\to\infty}\frac{\{2^n\sin(\theta/2^n)\}\sin\theta}{\sin(2^n\times\theta/2^n)}=\lim_{n\to\infty}\frac{\sin(\theta/2^n).\theta}{(\theta/2^n)}=\theta=a_0$$

10 **(b)**

Le the angles of triangle ABC be $A=\theta, B=2\,\theta$ and $C=7\,\theta$. Then,

$A+B+C=180°\Rightarrow 10\,\theta=180°\Rightarrow\theta=18°$

$\therefore A=18°, B=36°$ and $C=126°$

Clearly, c is the greatest side and a is the smallest side.

Now,

$$\frac{a}{\sin A}=\frac{c}{\sin C}$$

$$\Rightarrow\frac{c}{a}=\frac{\sin C}{\sin A}=\frac{\sin 126°}{\sin 18°}=\frac{\cos 36°}{\sin 18°}=\frac{\sqrt{5}+1}{\sqrt{5}-1}$$

11 **(b)**

We have,

$A=\frac{2\,\pi}{3}$ and $\Delta=\frac{9\sqrt{3}}{2}\text{cm}^2$

$\therefore\Delta=\frac{1}{2}bc\sin A\Rightarrow\frac{9\sqrt{3}}{2}=\frac{1}{2}\,bc\sin\frac{2\,\pi}{3}\Rightarrow bc=18$

Also,

$$\cos A = \frac{b^2 + c^2 - a^2}{2bc}$$

$$\Rightarrow \cos\frac{2\pi}{3} = \frac{(b-c)^2 + 2bc - a^2}{2bc}$$

$$\Rightarrow -\frac{1}{2} = \frac{27 + 36 - a^2}{36} \Rightarrow a^2 = 81 \Rightarrow a = 9 \text{ cm}$$

12 **(b)**

We have,

$s = 8k$ and, $\Delta = \sqrt{8k \times 3k \times 2k \times 3k} = 12\,k^2$

$$\therefore r = \frac{\Delta}{s} \Rightarrow \frac{12\,k^2}{8k} = 6 \Rightarrow k = 4$$

13 **(d)**

We have,

$$\frac{2^{\sin x} + 2^{\cos x}}{2} \geq \sqrt{2^{\sin x} 2^{\cos x}} \quad [\because AM \geq GM]$$

$$\Rightarrow 2^{\sin x} + 2^{\cos x} \geq \sqrt{2^{\sin x + \cos x}}$$

$$\Rightarrow 2^{\sin x} + 2^{\cos x} \geq 2\sqrt{2^{-\sqrt{2}}} \quad [\because -\sqrt{2} \leq \sin x + \cos x \leq \sqrt{2}]$$

$$\Rightarrow 2^{\sin x} + 2^{\cos x} \geq 2^{1-\frac{1}{\sqrt{2}}}$$

14 **(a)**

Let $A = \frac{1}{3\sin\theta - 4\cos\theta + 7}$

Now, A will be minimum when $3\sin\theta - 4\cos\theta + 7$ is maximum

$\therefore$ Maximum value of

$3\sin\theta - 4\cos\theta + 7 = \sqrt{3^2 + 4^2} + 7 = 12$

$\therefore$ Minimum value of $\frac{1}{3\sin\theta - 4\cos\theta + 7}$ is $\frac{1}{12}$

15 **(b)**

We have,

$$\operatorname{cosec}\theta = \frac{p+q}{p-q}$$

Now,

$$\cos\left(\frac{\pi}{4} + \frac{\theta}{2}\right) = \frac{1 - \tan\frac{\theta}{2}}{1 + \tan\frac{\theta}{2}} = \frac{\cos\frac{\theta}{2} - \sin\frac{\theta}{2}}{\cos\frac{\theta}{2} + \sin\frac{\theta}{2}}$$

$$\Rightarrow \cos\left(\frac{\pi}{4} + \frac{\theta}{2}\right) = \sqrt{\left(\frac{\cos\frac{\theta}{2} - \sin\frac{\theta}{2}}{\cos\frac{\theta}{2} + \sin\frac{\theta}{2}}\right)^2} = \sqrt{\frac{1 - \sin\theta}{1 + \sin\theta}}$$

$$\Rightarrow \cot\left(\frac{\pi}{4} + \frac{\theta}{2}\right) = \sqrt{\frac{\operatorname{cosec}\theta - 1}{\operatorname{cosec}\theta + 1}} = \sqrt{\frac{\frac{p+q}{p-q} - 1}{\frac{p+q}{p-q} + 1}} = \sqrt{\frac{q}{p}}$$

16 **(a)**

$\sin t + \cos t = \frac{1}{5}$

$\Rightarrow \ \frac{2\tan\frac{t}{2}}{1+\tan^2\frac{t}{2}} + \frac{1-\tan^2\frac{t}{2}}{1+\tan^2\frac{t}{2}} = \frac{1}{5}$

$\Rightarrow \ 10\tan\frac{t}{2} + 5 - 5\tan^2\frac{t}{2} = 1 + \tan^2\frac{t}{2}$

$\Rightarrow \ 6\tan^2\frac{t}{2} - 10\tan\frac{t}{2} - 4 = 0$

$\Rightarrow \ \left(6\tan\frac{t}{2} + 2\right)\left(\tan\frac{t}{2} - 2\right) = 0$

$\Rightarrow \ \tan\frac{t}{2} = \frac{-1}{3}, 2 \text{ for }, 0 < t < \pi$

$\tan\frac{t}{2} = 2$

17 **(a)**

We have,

$\sin\alpha\cos^3\alpha > \sin^3\alpha\cos\alpha$

$\Rightarrow \sin\alpha\cos\alpha\,(\cos^2\alpha - \sin^2\alpha) > 0$

$\Rightarrow \cos\alpha\,(1 - \tan^2\alpha) > 0 \ [\because \sin\alpha > 0 \text{ for } 0 < \alpha < \pi]$

$\Rightarrow \cos\alpha > 0 \text{ and } 1 - \tan^2\alpha > 0$

$\Rightarrow \cos\alpha < 0 \text{ and } 1 - \tan^2\alpha < 0$

$\Rightarrow \alpha \in (0, \pi/4) \text{ or}, \alpha \in (3\pi/4, \pi)$

18 **(a)**

We have, $\alpha + \beta + \gamma = \pi$

Now, $\sin^2\alpha + \sin^2\beta + \sin^2\gamma$

$= \sin^2\alpha + \sin^2(\beta - \gamma)\sin(\beta + \gamma)$

$= \sin^2\alpha + \sin(\pi - \alpha)\sin(\beta + \gamma) \ (\because \alpha + \beta - \gamma = \pi)$

$= \sin^2\alpha + \sin\alpha\ \sin(\beta + \gamma)$

$= \sin\alpha[\sin\alpha + \sin(\beta + \gamma)]$

$= \sin\alpha[\sin(\pi - (\beta - \gamma)) + \sin(\beta + \gamma)]$

$= \sin\alpha[\sin(\beta - \gamma) + \sin(\beta + \gamma)]$

$= \sin\alpha\,[2\sin\beta\cos\gamma]$

$= 2\sin\alpha\sin\beta\cos\gamma$

19 **(c)**

$\sec x \cos 5x = -1$

$\Rightarrow \ \cos 5x = -\cos x$

$\Rightarrow \ 5x = 2n\pi \pm (\pi - x)$

$$\Rightarrow\ x = \frac{(2n+1)\pi}{6} \text{ or } \frac{(2n-1)\pi}{6}$$

The possible values of x which lies in the interval $(0, 2\pi)$ are

$\frac{\pi}{4}, \frac{\pi}{6}, \frac{\pi}{2}, \frac{3\pi}{4}, \frac{5\pi}{6}, \frac{5\pi}{4}, \frac{7\pi}{6}, \frac{7\pi}{4}, \frac{9\pi}{6}$ and $\frac{11\pi}{6}$

ANSWER-KEY										
Q.	1	2	3	4	5	6	7	8	9	10
A.	A	B	A	C	C	D	C	C	A	C
Q.	11	12	13	14	15	16	17	18	19	20
A.	B	B	B	D	A	B	A	A	A	C

SESSION : 2025-26

DPP
DAILY PRACTICE PROBLEMS

Class : XIth
Date :

Solutions

Subject : MATHS
DPP No. :6

Topic :-TRIGONOMETRIC FUNCTIONS

1 **(a)**

$\cos(\alpha+\beta)=-\frac{12}{13}$

Here, $0<(\alpha+\beta)<\pi$

$\therefore \sin(\alpha+\beta)=\sqrt{1-\cos^2(\alpha+\beta)}$

$=\sqrt{1-\frac{144}{169}}$

$=\frac{5}{13}$

Now, $\sin\beta=\sin[(\alpha+\beta)-\alpha]$

$=\sin(\alpha+\beta)\cos\alpha-\cos(\alpha+\beta)\sin\alpha$

$=\frac{5}{13}\cdot\frac{3}{5}-\left(-\frac{12}{13}\right)\cdot\frac{4}{5}$

$=\frac{15}{65}+\frac{48}{65}$

$=\frac{63}{65}$

2 **(c)**

We have,

$\sin\frac{\pi}{14}\sin\frac{3\pi}{14}\sin\frac{5\pi}{14}\sin\frac{7\pi}{14}$

$=\sin\left(\frac{\pi}{2}-\frac{3\pi}{7}\right)\sin\left(\frac{\pi}{2}-\frac{2\pi}{7}\right)\sin\left(\frac{\pi}{2}-\frac{\pi}{7}\right)\sin\frac{\pi}{2}$

$=\cos\frac{3\pi}{7}\cos\frac{2\pi}{7}\cos\frac{\pi}{7}$

$=-\cos\frac{\pi}{7}\cos\frac{2\pi}{7}\cos\frac{4\pi}{7}$

$=-\frac{\sin(2^3\pi/7)}{2^3\sin\pi/7}=-\frac{\sin(8\pi/7)}{8\sin\pi/7}=\frac{1}{8}$

3 **(b)**

We have,

$\sin\theta\cos\alpha+\cos\theta\sin\alpha=2\,k\sin\theta\cos\theta$

$\Rightarrow \cos\alpha\frac{2\,t}{1+t^2}+\sin\alpha\frac{1-t^2}{1+t^2}=2k\frac{2t}{1+t^2}\times\frac{1-t^2}{1+t^2}$

where $t = \tan\dfrac{\theta}{2}$

$\Rightarrow \sin\alpha\, t^4 - (2\cos\alpha + 4k)t^3 + t(4k - 2\cos\alpha) - \sin\alpha = 0$

$\Rightarrow S_1 = 2\cos\alpha + 4k, S_2 = 0$

$S_3 = 2\cos\alpha - 4k, S_4 = -1$

where S_r denotes the sum of the product of roots taken r at a time

Now,

$\tan\left(\dfrac{\theta_1}{2} + \dfrac{\theta_2}{2} + \dfrac{\theta_3}{2} + \dfrac{\theta_4}{2}\right) = \dfrac{S_1 - S_3}{1 - S_2 + S_4} = \infty = \tan\left(\dfrac{\pi}{2}\right)$

$\Rightarrow \dfrac{\theta_1}{2} + \dfrac{\theta_2}{2} + \dfrac{\theta_3}{2} + \dfrac{\theta_4}{2} = n\pi + \dfrac{\pi}{2}, n \in Z$

$\Rightarrow \theta_1 + \theta_2 + \theta_3 + \theta_4 = (2n+1)\pi, n \in Z$

4 **(b)**

Let r be the radius of the circle. Then,

$\dfrac{3\pi}{4} = \dfrac{15\pi}{r} \Rightarrow r = 20$ cm

5 **(a)**

We know that

$\cot\alpha - \tan\alpha = 2\cot 2\alpha$

$\therefore \cot\theta - \tan\theta - 2\tan 2\theta - 4\tan 4\theta - 8\cot 8\theta$

$= 2\cot 2\theta - 2\tan 2\theta - 4\tan 4\theta - 8\cot 8\theta$

$= 2(2\cot 4\theta) - 4\tan 4\theta - 8\cot 8\theta$

$= 4\cot 4\theta - 4\tan 4\theta - 8\cot 8\theta$

$= 4(\cot 4\theta - \tan 4\theta) - 8\cot 8\theta$

$= 4 \times 2\cot 8\theta - 8\cot 8\theta = 0$

6 **(d)**

We have,

$b = \sqrt{3}, c = 1$ and $A = 30°$

$\therefore \cos A = \dfrac{b^2 + c^2 - a^2}{2bc} \Rightarrow \dfrac{\sqrt{3}}{2} = \dfrac{4 - a^2}{2\sqrt{3}} \Rightarrow a = 1$

$\therefore \dfrac{a}{\sin A} = \dfrac{b}{\sin B} = \dfrac{c}{\sin C}$

$\Rightarrow 2 = \dfrac{\sqrt{3}}{\sin B} = \dfrac{1}{\sin C}$

$\Rightarrow \sin B = \dfrac{\sqrt{3}}{2}$ and $\sin C = \dfrac{1}{2}$

$\Rightarrow B = 120°$ and $C = 30°\quad [\because b > c \therefore B > C]$

7 **(c)**

Here, $a = 3,\ b = 4$

$\therefore$ maximum value$= \sqrt{3^2 + 4^2} = 5$

8 **(a)**

Let ABC be the triangle such that $a = 2, b = \sqrt{6}$ and $c = \sqrt{3} - 1$

Clearly, $b > a > c$

So, B is the greatest angle and C is the smallest angle

Now,

$$\cos B = \frac{c^2 + a^2 - b^2}{2ac}$$

$$\Rightarrow \cos B = \frac{(\sqrt{3}-1)^2 + 4 - 6}{4(\sqrt{3}-1)^2} = -\frac{1}{2} \Rightarrow B = 120°$$

And,

$$\cos C = \frac{a^2 + b^2 - c^2}{2ab}$$

$$\Rightarrow \cos C = \frac{4 + 6 - (\sqrt{3}-1)^2}{4\sqrt{6}} = \frac{\sqrt{3}+1}{2\sqrt{2}} \Rightarrow C = 15°$$

9 **(b)**

We have,

$$\frac{1}{r} = \frac{1}{r_1} + \frac{1}{r_2} + \frac{1}{r_3}$$

$$\Rightarrow \frac{1}{r} = \frac{1}{16} + \frac{1}{48} + \frac{1}{24} \Rightarrow r = 8$$

10 **(c)**

Given, $3\sin^2 x - 7\sin x + 2 = 0$

$(3\sin x - 1)(\sin x - 2) = 0$

$\Rightarrow \sin x = \frac{1}{3}$ or 2

$\Rightarrow \sin x = \frac{1}{3} \quad [\because \sin x \neq 2]$

Let $\sin^{-1}\frac{1}{3} = \alpha, 0 < \alpha < \frac{\pi}{2}$, then $\alpha, \pi - \alpha, 2\pi + \alpha, 3\pi - \alpha, 4\pi + \alpha, 5\pi - \alpha$ are the solution in $[0, 5\pi]$

Hence, required number of solutions are 6

11 **(a)**

We have, $\cos^2\theta = \cos 2\theta$

$\Rightarrow \cos^2\theta = 2\cos^2\theta - 1$

$\Rightarrow \cos^2\theta = 1 \Rightarrow \theta = n\pi$

12 **(a)**

The given equation is

$3^{\sin 2x + 2\cos^2 x} + 3^{1 - \sin 2x + 2\sin^2 x} = 28$

$\Rightarrow 3^{\sin 2x + 2\cos^2 x} + 3^{3 - (\sin 2x + 2\cos^2 x)} = 28$

$\Rightarrow y + \frac{27}{y} = 28$, where $y = 3^{\sin 2x + 2\cos^2 x}$

$\Rightarrow y^2 - 28y + 27 = 0 \Rightarrow y = 27$ or, $y = 1$

If $y = 27$, then

$3^{\sin 2x + 2\cos^2 x} = 3^3$

$\Rightarrow \sin 2x + 2\cos^2 x = 3$

$\Rightarrow \sin 2x + 2\cos 2x = 2$

$\Rightarrow \sin 2x = 2\cos 2x = 1$

$\Rightarrow \sin x = 0 \text{ or}, \tan x = \dfrac{1}{2}$

If $y = 1$

$\Rightarrow 3^{\sin 2x + 2\cos^2 x} = 1$

$\Rightarrow \sin 2x + 2\cos^2 x = 0$

$\Rightarrow 2\cos x(\sin x + \cos x) = 0$

$\Rightarrow \cos x = 0 \text{ or}, \tan x = -1$

13 **(c)**

Let $f(x) = 27^{\cos 2x} 81^{\sin 2x} = 3^{3\cos 2x + 4\sin 2x}$

$= 3^{5\left(\frac{3}{5}\cos 2x + \frac{4}{5}\sin 2x\right)}$

Let $\frac{3}{5} = \sin \phi$

$\Rightarrow \dfrac{4}{5} = \cos \phi$

Then, $f(x) = 3^{5(\sin \phi \cos 2x + cos\phi \sin 2x)}$

$= 3^{5(\sin(\phi + 2x))}$

For minimum value of given function,

$\sin(\phi + 2x)$ will be minimum

ie, $\sin(\phi + 2x) = -1$

$\therefore \quad f(x) = 3^{5(-1)} = \dfrac{1}{243}$

14 **(c)**

We have,

$$\sec 2x - \tan 2x = \frac{1 - \sin 2x}{\cos 2x}$$

$$\Rightarrow \sec 2x - \tan 2x = \frac{1 - \cos\left(\frac{\pi}{2} - 2x\right)}{\sin\left(\frac{\pi}{2} - 2x\right)}$$

$$\Rightarrow \sec 2x - \tan 2x = \frac{2\sin^2(\pi/4 - x)}{2\sin(\pi/4 - x)\cos(\pi/4 - x)} = \tan\left(\frac{\pi}{4} - x\right)$$

15 **(a)**

$\because \ \sin^5 x - \cos^5 x = \dfrac{\sin x - \cos x}{\sin x \cos x}$

$\Rightarrow \ \sin x \cos x \left[\dfrac{\sin^5 x - \cos^5 x}{\sin x - \cos x}\right] = 1$

$\Rightarrow \ \dfrac{1}{2}\sin 2x[\sin^4 x + \sin^3 x \cos x + \sin^2 x \cos^2 x + \sin x \cos^2 x + \cos^4 x] = 1$

$\Rightarrow \ \sin 2x[\,(\sin^2 x + \cos^2 x)^2 - 2\sin^2 \ x \cos^2 x$

$+ \sin x \cos x(\sin^2 x + \cos^2 x) + \sin^2 x + \ \cos^2 x] = 2$

$\Rightarrow \sin 2x[1 - \sin^2 x \cos^2 x + \sin x \cos x] = 2$

$\Rightarrow \sin^3 2x - 2\sin^2 2x - 4\sin 2x + 8 = 0$

$\Rightarrow (\sin 2x - 2)^{\,2}\,(\sin 2x + 2) = 0$

$\Rightarrow \sin 2x = \pm 2$, which is not possible for any x

16 **(b)**

$\cos(\alpha+\beta) = \frac{4}{5} \Rightarrow \alpha+\beta \in$ 1st quadrant and

$\sin(\alpha-\beta) = \dfrac{5}{13}$

$\Rightarrow\ \alpha-\beta \in$ 1st quadrant

$\Rightarrow\ \ 2\alpha = (\alpha+\beta)+(\alpha-\beta)$

$\therefore\ \tan 2\alpha = \dfrac{\tan(\alpha+\beta)+\tan(\alpha-\beta)}{1-\tan(\alpha+\beta)\tan(\alpha-\beta)}$

$= \dfrac{\frac{3}{4}+\frac{5}{12}}{1-\frac{3}{4}\cdot\frac{5}{12}} = \dfrac{56}{33}$

17 **(d)**

We have,

$\cos\dfrac{2\pi}{7}+\cos\dfrac{4\pi}{7}+\cos\dfrac{6\pi}{7}$

$= \dfrac{1}{2\sin\frac{\pi}{7}}\left\{2\sin\dfrac{\pi}{7}\cos\dfrac{2\pi}{7}+2\sin\dfrac{\pi}{7}\cos\dfrac{4\pi}{7}+2\sin\dfrac{\pi}{7}\cos\dfrac{6\pi}{7}\right\}$

$= \dfrac{1}{2\sin\frac{\pi}{7}}\left\{\sin\dfrac{3\pi}{7}-\sin\dfrac{\pi}{7}+\sin\dfrac{5\pi}{7}-\sin\dfrac{3\pi}{7}+\sin\pi-\sin\dfrac{5\pi}{7}\right\}$

$= -\dfrac{1}{2}$

18 **(a)**

We have,

$2a\cos^2\left(\dfrac{C}{2}\right)+2c\cos^2\left(\dfrac{A}{2}\right) = 3b$

$\Rightarrow a(1+\cos C)+c(1+\cos A) = 3b$

$\Rightarrow a+c+(a\cos C+c\cos A) = 3b$

$\Rightarrow a+c+b = 3\,b \Rightarrow a+c = 2b \Rightarrow a, b, c$ are in A.P.

19 **(d)**

Given that, $\frac{1-\cos 2\theta}{1+\cos 2\theta} = 3$

$\Rightarrow\ \dfrac{2\sin^2\theta}{2\cos^2\theta} = 3$

$\Rightarrow\ \tan^2\theta = \left(\sqrt{3}\right)^2$

$\Rightarrow\ \tan^2\theta = \tan^2\dfrac{\pi}{3}$

$\Rightarrow\ \theta = n\pi \pm \dfrac{\pi}{3}$

20 **(b)**

We have,

$a = 5$ cm, $b = 4$ cm and $\cos(A-B) = \frac{31}{32}$

$\therefore \tan\dfrac{A-B}{2} = \dfrac{a-b}{a+b}\cot\dfrac{C}{2}$

$$\Rightarrow \sqrt{\frac{1-\cos(A-B)}{1+\cos(A-B)}} = \frac{a-b}{a+b}\sqrt{\frac{1+\cos C}{1-\cos C}}$$

$$\Rightarrow \frac{1-\frac{31}{32}}{1+\frac{31}{32}} = \left(\frac{5-4}{5+4}\right)^2 \left(\frac{1+\cos C}{1-\cos C}\right)$$

$$\Rightarrow \frac{81}{63} = \frac{1+\cos C}{1-\cos C} \Rightarrow \cos C = \frac{1}{8}$$

ANSWER-KEY										
Q.	1	2	3	4	5	6	7	8	9	10
A.	A	C	B	B	A	D	C	A	B	C
Q.	11	12	13	14	15	16	17	18	19	20
A.	A	A	C	C	A	B	D	A	D	B

SESSION : 2025-26

DPP
DAILY PRACTICE PRODUCTS

Class : XIth
Date :

Solutions

Subject : MATHS
DPP No. :7

Topic :-TRIGONOMETRIC FUNCTIONS

1 **(a)**

Given, $\sin 2x+\cos 4x=2$

$\Rightarrow\ \sin 2x+1-2\sin^2 2x=2$

$\Rightarrow\ 2\sin^2 2x-\sin 2x+1=0$

Now, Discriminant, $D=(-1)^2-4.2.1=-7<0$

Hence, it is an imaginary equation, so the real root does not exist.

2 **(d)**

We have,

$\sin\theta_1+\sin\theta_2+\sin\theta_3=3$

$\Rightarrow \sin\theta_1=\sin\theta_2=\sin\theta_3=1\quad [\because -1\leq \sin x\leq 1]$

$\Rightarrow \theta_1=\theta_2=\theta_3=\dfrac{\pi}{2}\Rightarrow \cos\theta_1+\cos\theta_2+\cos\theta_3=0$

3 **(b)**

We have,

$k\sin x+(1-2\sin^2 x)=2k-7$

$\Rightarrow 2\sin^2 x-k\sin x+2(k-4)=0$

$\Rightarrow \sin x=\dfrac{k\pm\sqrt{k^2-16\,k+64}}{4}=\dfrac{k\pm(k-8)}{4}=\dfrac{1}{2}(k-4),2$

$\Rightarrow \sin x=\dfrac{1}{2}(k-4)\qquad [\because \sin x\neq 2]$

Now, $-1\leq \sin x\leq 1\Rightarrow -1\leq \frac{k-4}{2}\leq 1\Rightarrow 2\leq k\leq 6$

4 **(b)**

Given that, $\cos 2B=\frac{\cos(A+C)}{\cos(A-C)}$

$=\dfrac{\cos A\cos C-\sin A\sin C}{\cos A\cos C+\sin A\sin C}$

$\Rightarrow \dfrac{1-\tan^2 B}{1+\tan^2 B}=\dfrac{1-\tan A\tan C}{1+\tan A\tan C}$

$\Rightarrow 1+\tan^2 B-\tan A\tan C-\tan A\tan C\tan^2 B$

$=1-\tan^2 B+\tan A\tan C-\tan A\tan C\tan^2 B$

$\Rightarrow 2\tan^2 B = 2\tan A \tan C$

$\Rightarrow \tan^2 B = \tan A \tan C$

Hence, $\tan A, \tan B$ and $\tan C$ will be in GP

5 **(c)**

We have,

$$\left(\frac{\cos A + \cos B}{\sin A - \sin B}\right)^n + \left(\frac{\sin A + \sin B}{\cos A - \cos B}\right)^n$$

$$= \left(\cot\frac{A-B}{2}\right)^n + \left(-\cot\frac{A-B}{2}\right)^n$$

$$= \{1 + (-1)^n\}\cot^n\left(\frac{A-B}{2}\right)$$

$$= 0 \times \cot^n\left(\frac{A-B}{2}\right) = 0 \quad [\because n \text{ is odd}]$$

6 **(a)**

We have,

$a\tan\theta + b\sec\theta = c$

$\Rightarrow b\sec\theta = c - a\tan\theta$

$\Rightarrow b^2\sec^2\theta = c^2 + a^2\tan^2\theta - 2\,ac\tan\theta$

$\Rightarrow b^2(1 + \tan^2\theta) = c^2 + a^2\tan^2\theta - 2\,ac\tan\theta$

$\Rightarrow \tan^2\theta(b^2 - a^2) + 2\,ac\tan\theta + b^2 - c^2 = 0$

Since $\tan\alpha$ and $\tan\beta$ are roots of this equation

$$\therefore \tan\alpha + \tan\beta = \frac{-2\,ac}{b^2 - a^2} \text{ and } \tan\alpha\tan\beta = \frac{b^2 - c^2}{a^2 - c^2}$$

Now,

$$\tan(\alpha + \beta) = \frac{\tan\alpha + \tan\beta}{1 - \tan\alpha\tan\beta} = \frac{-\frac{2\,ac}{b^2 - a^2}}{1 - \frac{b^2 - c^2}{b^2 - a^2}} = \frac{2\,ac}{a^2 - c^2}$$

7 **(b)**

$$\tan\theta + \frac{\tan\theta + \sqrt{3}}{1 - \sqrt{3}\tan\theta} + \frac{\tan\theta - \sqrt{3}}{1 + \sqrt{3}\tan\theta} = 3$$

$$\Rightarrow \tan\theta + \frac{8\tan\theta}{1 - 3\tan^2\theta} = 3$$

$$\Rightarrow \frac{9\tan\theta - 3\tan^3\theta}{1 - 3\tan^2\theta} = 3$$

$$\Rightarrow \quad 3\tan 3\theta = 3 \quad \Rightarrow \quad \tan 3\theta = 1$$

8 **(a)**

Since, $y = 1 + 4\sin^2 x\cos^2 x$

$\Rightarrow y = 1 + \sin^2 2x$

We know that, $0 \le \sin^2 2x \le 1$

$\Rightarrow 1 \leq 1 + \sin^2 2x \leq 2$

$\Rightarrow 1 \leq y \leq 2$

9 **(a)**

$\sin^2 \alpha + \sin^2 \beta - \sin^2 \gamma$
$= \sin^2 \alpha + \sin(\beta - \gamma)\sin(\beta + \gamma)$
$= \sin^2 \alpha \sin(\pi - \alpha)\sin(\beta + \gamma) \quad [\because\ \alpha + \beta - \gamma = \pi]$
$= \sin\alpha[\sin\alpha + \sin(\beta + \gamma)]$
$= \sin\alpha[\sin\{\pi - (\beta - \gamma)\} + \sin(\beta + \gamma)]$
$= \sin\alpha[\sin(\beta - \gamma) + \sin(\beta + \gamma)]$
$= \sin\alpha[2\sin\beta\cos\gamma]$
$= 2\sin\alpha\sin\beta\cos\gamma$

10 **(a)**

We have,

$$\cot\frac{A}{2} + \cot\frac{B}{2} + \cot\frac{C}{2}$$
$$= \frac{s(s-a)}{\Delta} + \frac{s(s-b)}{\Delta} + \frac{s(s-c)}{\Delta} = \frac{s}{\Delta}(3s - 2s) = \frac{s^2}{\Delta}$$

And,

$$\cot A + \cot B + \cot C$$
$$= \frac{\cos A}{\sin A} + \frac{\cos B}{\sin B} + \frac{\cos C}{\sin C}$$
$$= \frac{b^2 + c^2 - a^2}{2\,bc\sin A} + \frac{c^2 + a^2 - b^2}{2ac\sin B} + \frac{a^2 + b^2 - c^2}{2ab\sin C}$$
$$= \frac{b^2 + c^2 - a^2}{4\,\Delta} + \frac{c^2 + a^2 - b^2}{4\,\Delta} + \frac{a^2 + b^2 - c^2}{4\,\Delta}$$
$$= \frac{a^2 + b^2 + c^2}{4\,\Delta}$$
$$\therefore \frac{\cot\frac{A}{2} + \cot\frac{B}{2} + \cot\frac{C}{2}}{\cot A + \cot B + \cot C} = \frac{\frac{s^2}{\Delta}}{\frac{a^2+b^2+c^2}{4\,\Delta}}$$
$$= \frac{(2s)^2}{a^2 + b^2 + c^2} = \frac{(a + b + c)^2}{a^2 + b^2 + c^2}$$

11 **(a)**

$\because \quad (\tan\alpha - \cot\alpha)^2 \geq 0$
$\Rightarrow \ \tan^2\alpha + \cot^2\alpha - 2 \geq 0$
$\Rightarrow \ \tan^2\alpha + \cot^2\alpha \geq 2$

12 **(a)**

We have,

$\tan m\,\theta = \tan n\,\theta$

$\Rightarrow m\,\theta = t\,\pi + n\,\theta$, where $r \in Z$

$\Rightarrow \theta = \dfrac{r\,\pi}{m - n}, r \in Z$

Clearly, these values of θ from an A.P. with common difference $\frac{\pi}{m-n}$

13 **(a)**

We have,

$$\frac{\sin A}{\sin C} = \frac{\sin(A-B)}{\sin(B-C)}$$

$$\Rightarrow \frac{\sin(B+C)}{\sin(a+B)} = \frac{\sin(A-B)}{\sin(B-C)}$$

$\Rightarrow \sin^2 B - \sin^2 C = \sin^2 A - \sin^2 B$

$\Rightarrow b^2 - c^2 = a^2 - b^2$

$\Rightarrow a^2, b^2, c^2$ are in A.P.

14 **(a)**

Let $\sec\theta - \tan\theta = \lambda$ ...(i)

Then,

$$(\sec\theta + \tan\theta) = \frac{1}{\sec\theta - \tan\theta}$$

$\Rightarrow \sec\theta + \tan\theta = \frac{1}{\lambda}$ ...(ii)

$\therefore 2\tan\theta = \frac{1}{\lambda} + \lambda$ [On subtracting (i) from (ii)]

$$\Rightarrow 2x - \frac{1}{2x} = \frac{1}{\lambda} - \lambda$$

$$\Rightarrow \lambda = \frac{1}{2x}, -2x \Rightarrow \sec\theta - \tan\theta = \frac{1}{2x}, -2x$$

15 **(d)**

We observe that the LHS of the given equation is not defined for $x = n\pi, n \in Z$

Now,

$\cot x - \operatorname{cosec} x = 2\sin x$

$\Rightarrow \cot x - 1 = 2\sin^2 x$

$\Rightarrow 2\cos^2 x + \cos x - 3 = 0$

$\Rightarrow (2\cos x + 3)(\cos x - 1) = 0$

$\Rightarrow \cos x = 1$ $[\because 2\cos x + 3 \neq 0]$

$\Rightarrow x = 0, 2\pi$

But, $x \neq n\pi, n \in Z$

Hence, the given equation has no solution

16 **(d)**

Given, $\frac{\sin x}{\sin y} = \frac{1}{2}, \frac{\cos x}{\cos y} = \frac{3}{2}$

$$\Rightarrow \frac{\tan x}{\tan y} = \frac{1}{3}$$

$$\tan(x+y) = \frac{\tan x + \tan y}{1 - \tan x \tan y} = \frac{4\tan x}{1 - 3\tan^2 x}$$

Also, $\sin y = 2\sin x, \cos y = \frac{2}{3}\cos x$

$$\Rightarrow \sin^2 y + \cos^2 y = 4\sin^2 x + \frac{4\cos^2 x}{9} = 1$$

$$\Rightarrow 36\tan^2 x + 4 = 9\sec^2 x = 9(1 + \tan^2 x)$$

$$\Rightarrow 27\ \tan^2 x = 5$$

$$\Rightarrow \tan x = \frac{\sqrt{5}}{3\sqrt{3}}$$

$$\Rightarrow \tan(x + y) = \frac{\frac{4\sqrt{5}}{3\sqrt{3}}}{1 - \frac{15}{27}} = \sqrt{15}$$

17 **(d)**

$$\frac{\cos 9° + \sin 9°}{\cos 9° - \sin 9°} = \frac{1 + \tan 9°}{1 - \tan 9°}$$
$$= \tan(45° + 9°)$$
$$= \tan 54°$$

ANSWER-KEY										
Q.	1	2	3	4	5	6	7	8	9	10
A.	A	D	B	B	C	A	B	A	A	A
Q.	11	12	13	14	15	16	17	18	19	20
A.	A	A	A	A	D	C	D	A	A	D

DPP
DAILY PRACTICE PROBLEMS

Class : XIth
Subject : MATHS
Date :
DPP No. :8

Solutions

Topic :-TRIGONOMETRIC FUNCTIONS

1 **(a)**

Let ABC be the triangle such that $a = 2\sqrt{2}$ cm, $b = 2\sqrt{3}$ cm and $\angle A = \frac{\pi}{4}$

$\therefore \cos A = \dfrac{b^2 + c^2 - a^2}{2bc}$

$\Rightarrow \dfrac{1}{\sqrt{2}} = \dfrac{12 + c^2 - 8}{4\sqrt{3}\, c}$

$\Rightarrow 4 + c^2 = 2\sqrt{6}\, c$

$\Rightarrow c^2 - 2\sqrt{6}\, c + 4 = 0$

$\Rightarrow c = \dfrac{2\sqrt{6} \pm \sqrt{24 - 16}}{2}$

$\Rightarrow c = \sqrt{6} \pm \sqrt{2} \Rightarrow c = \sqrt{6} + \sqrt{2}$ [$\because c$ is the largest side]

2 **(b)**

We have,

$r \sin\theta = 3$ and $r = 4(1 + \sin\theta)$

$\Rightarrow r = 4 + \dfrac{12}{r}$

$\Rightarrow r^2 - 4r - 12 = 0$

$\Rightarrow (r - 6)(r + 2) = 0$

$\Rightarrow r = 6 \quad [\because r > 0]$

$\therefore r \sin\theta = 3 \Rightarrow \sin\theta = \dfrac{1}{2} \Rightarrow \theta = \dfrac{\pi}{6}, \dfrac{5\pi}{6}$

Hence, the total number of ordered pairs of the form (r, θ) is $1 \times 2 = 2$

3 **(d)**

We have,

$\sin 65° + \sin 43° - \sin 29° - \sin 7°$

$= (\sin 65° + \sin 43°) - (\sin 29° + \sin 7°)$

$= 2 \sin 54° \cos 11° - 2 \sin 18° \cos 11°$

$= 2 \cos 11° (\cos 36° - \sin 18°)$

$= 2 \cos 11° \left(\dfrac{\sqrt{5} + 1}{4} - \dfrac{\sqrt{5} - 1}{4}\right) = \cos 11°$

4 **(c)**

We have,

$\sin B = \dfrac{1}{5} \sin(2A + B)$

$\Rightarrow \dfrac{\sin(2A + B)}{\sin B} = \dfrac{5}{1}$

$\Rightarrow \dfrac{\sin(2A + B) + \sin B}{\sin(2A + B) - \sin B} = \dfrac{5 + 1}{5 - 1}$

$\Rightarrow \dfrac{2 \sin(A + B) \cos A}{2 \sin A \cos(A + B)} = \dfrac{3}{2}$

$\Rightarrow \dfrac{\tan(A + B)}{\tan A} = \dfrac{3}{2}$

5 **(b)**

Since, $A + B + C = \pi$

$\Rightarrow a = \pi - (B + C)$

We have, $\cos A = \cos B \cos C$

$\Rightarrow \cos[\pi - (B + C)] = \cos B \cos C$

$\Rightarrow -\cos(B + C) = \cos B \cos C$

$\Rightarrow -[\cos B \cos C - \sin B \sin C] = \cos B \cos C$

$\Rightarrow \sin B \sin C = 2 \cos B \cos C$

$\Rightarrow \tan B \tan C = 2$

6 **(a)**

We have,

$\sin x + \operatorname{cosec} x = 2 \Rightarrow (\sin x - 1)^2 = 0 \Rightarrow \sin x = 1$

$\therefore \sin^n x + \operatorname{cosec}^n x = 1 + 1 = 2$

7 **(a)**

We have,

$\dfrac{a^2 - b^2}{a^2 + b^2} = \dfrac{\sin(A - B)}{\sin(A + B)}$

$\Rightarrow \dfrac{\sin^2 A - \sin^2 B}{\sin^2 A + \sin^2 B} = \dfrac{\sin^2 A - \sin^2 B}{\sin^2(A + B)}$

$\Rightarrow (\sin^2 A - \sin^2 B)(\sin^2 A + \sin^2 B - \sin^2 C) = 0$

$\Rightarrow \sin(A + B) \sin(A - B)(\sin^2 A + \sin^2 B - \sin^2 C) = 0$

$\Rightarrow \sin(A - B) = 0$ or, $\sin^2 A + \sin^2 B = \sin^2 C$

$\Rightarrow A = B$ or, $a^2 + b^2 = c^2$

$\Rightarrow \Delta ABC$ is either right angled or isosceles

8 **(c)**

We have,

$\cos A = \cos B \cos C$

$\Rightarrow \cos\{\pi - (B + C)\} = \cos B \cos C$

$\Rightarrow -\cos(B + C) = \cos B \cos C$

$\Rightarrow 2\cos B \cos C = \sin B \sin C$

$\Rightarrow \cot B \cot C = \dfrac{1}{2}$

9 **(c)**

We have,

$2s = a + b + c = 13 + 14 + 15$

$\Rightarrow s = 21$

$\Rightarrow s - a = 8, s - b = 7$ and $s - c = 6$

Now,

$\dfrac{1}{r_1} : \dfrac{1}{r_2} : \dfrac{1}{r_3} = \dfrac{s-a}{\Delta} : \dfrac{s-b}{\Delta} : \dfrac{s-c}{\Delta}$

$\Rightarrow \dfrac{1}{r_1} : \dfrac{1}{r_2} : \dfrac{1}{r_3} = s - a : s - b : s - c = 8 : 7 : 6$

10 **(a)**

We have,

$\dfrac{\sin 7\theta + 6\sin 5\theta + 17\sin 3\theta + 12\sin\theta}{\sin 6\theta + 5\sin 4\theta + 12\sin 2\theta}$

$= \dfrac{(\sin 7\theta + \sin 5\theta) + 5(\sin 5\theta + \sin 3\theta) + 12(\sin 3\theta + \sin\theta)}{\sin 6\theta + 5\sin 4\theta + 12\sin 2\theta}$

$= \dfrac{2\sin 6\theta\cos\theta + 10\sin 4\theta\cos\theta + 24\sin 2\theta\cos\theta}{\sin 6\theta + 5\sin 4\theta + 12\sin 2\theta}$

$= \dfrac{2\cos\theta\,(\sin 6\theta + 5\sin 4\theta + 12\sin 2\theta)}{\sin 6\theta + 5\sin 4\theta + 12\sin 2\theta}$

$= 2\cos\theta$

11**(a)**

Let the angles be $A = x - d, B = x, C = x + d$. Then,

$x - d + x + x + d = 180° \Rightarrow x = 60°$

Therefore, two larger angles are $B = 60°$ and C

Hence, $b = 9$ and $c = 10$

Now,

$$\cos B = \frac{c^2 + a^2 - b^2}{2\,ac}$$

$$\Rightarrow \frac{1}{2} = \frac{100 + a^2 - 81}{20\,a} \Rightarrow a^2 - 10\,a + 19 = 0 \Rightarrow a = 5 \pm \sqrt{6}$$

853 **(b)**

Since, $\cos 2x, \frac{1}{2}, \sin 2x$ are in AP

$\Rightarrow \cos 2x + \sin 2x = 1$

$\Rightarrow \sin 2x = 1 - \cos 2x = 2\sin^2 x$

$\Rightarrow 2\sin x(\cos x - \sin x) = 0$

$\Rightarrow \sin x = 0$ or $\cos x - \sin x = 0$

$\Rightarrow x = n\pi$ or $\tan x = 1$

$\Rightarrow x = n\pi$ or $x = n\pi + \dfrac{\pi}{4}$

Thus, required values of x are $n\pi$ and $n\pi + \frac{\pi}{4}$

12 **(b)**

$$\cos\frac{\pi}{18} + \cos\frac{2\pi}{18} + \ldots + \cos\frac{16\pi}{18} + \cos\frac{17\pi}{18} + \cos\pi$$

$$= \cos\frac{\pi}{18} + \cos\frac{2\pi}{18} + \ldots - \cos\frac{2\pi}{18} - \cos\frac{\pi}{18} + \cos\pi$$

$= \cos\pi = -1$

13 **(b)**

Given that, $\sin\theta + \cos\theta = 1$

$$\Rightarrow \frac{1}{\sqrt{2}}\sin\theta + \frac{1}{\sqrt{2}}\cos\theta = \frac{1}{\sqrt{2}}$$

$$\Rightarrow \sin\left(\theta + \frac{\pi}{4}\right) = \frac{1}{\sqrt{2}} = \sin\frac{\pi}{4}$$

$$\Rightarrow \theta + \frac{\pi}{4} = n\pi + (-1)^n\frac{\pi}{4}$$

$$\Rightarrow \theta = n\pi + (-1)^n\frac{\pi}{4} - \frac{\pi}{4}$$

14 **(d)**

We have,

$0 < x < \pi \Rightarrow \sin x > 0$

Now,

$1 + \sin x + \sin^2 x + \cdots \infty = 4 + 2\sqrt{3}$

$$\Rightarrow \frac{1}{1 - \sin x} = 4 + 2\sqrt{3}$$

$$\Rightarrow \sin x = 1 - \frac{1}{4 + 2\sqrt{3}}$$

$$\Rightarrow \sin x = \frac{3 + 2\sqrt{3}}{4 + 2\sqrt{3}} = \frac{\sqrt{3}}{2} \Rightarrow x = \frac{\pi}{3} \text{ or, } \frac{2\pi}{3}$$

15 **(b)**

$$\frac{\sin x + \sin y}{\cos x + \cos y} = \frac{a}{b}$$

$$\Rightarrow \quad \frac{2\sin\left(\frac{x+y}{2}\right)\cos\left(\frac{x-y}{2}\right)}{2\cos\left(\frac{x+y}{2}\right)\cos\left(\frac{x-y}{2}\right)} = \frac{a}{b}$$

$$\Rightarrow \tan\left(\frac{x+y}{2}\right) = \frac{a}{b}$$

16 **(b)**

The given equation can be written as

$$\cos(\pi \tan\theta) = \cos\left(\frac{\pi}{2} - \pi\cot\theta\right)$$

$$\Rightarrow \pi\tan\theta = 2n\pi \pm \left(\frac{\pi}{2} - \pi\cot\theta\right), n \in Z$$

$$\Rightarrow \tan\theta = 2n \pm \left(\frac{1}{2} - \cot\theta\right), n \in Z$$

$$\Rightarrow \tan\theta - \cot\theta = 2n - \frac{1}{2}, n \in Z \quad \text{[Taking negative sign]}$$

$$\Rightarrow \frac{\tan^2\theta - 1}{\tan\theta} = 2n - \frac{1}{2}$$

$$\Rightarrow \frac{\tan^2\theta - 1}{2\tan\theta} = n - \frac{1}{4}$$

$$\Rightarrow \frac{1 - \tan^2\theta}{2\tan\theta} = -n + \frac{1}{4}$$

$$\Rightarrow \cot 2\theta = m + \frac{1}{4}, \text{ where } m = -n \in Z$$

17 **(c)**

From Questions 47, we have

$$\Delta = \frac{1}{2}ap_1, \Delta = \frac{1}{2}bp_2, \Delta = \frac{1}{2}cp_3$$

Now,

p_1, p_2, p_3 are in A.P.

$$\Rightarrow \frac{2\Delta}{a}, \frac{2\Delta}{b}, \frac{2\Delta}{c} \text{ are in A. P.}$$

$$\Rightarrow \frac{1}{a}, \frac{1}{b}, \frac{1}{c} \text{ are in A. P.} \Rightarrow a, b, c \text{ are in H. P.}$$

18 **(d)**

$$\cos\frac{\pi}{5}\cos\frac{2\pi}{5}\cos\frac{4\pi}{5}\cos\frac{8\pi}{5} = \frac{\sin 2^4\frac{\pi}{5}}{2^4\sin\frac{\pi}{5}} \left(\because \cos x\cos 2x\cos 4x \ldots \cos 2nx = \frac{\sin 2^n x}{2^n \sin x}\right)$$

$$= \frac{\sin\frac{16\pi}{5}}{16\sin\frac{\pi}{5}} = \frac{\sin\left(3\pi + \frac{\pi}{5}\right)}{16\sin\frac{\pi}{5}}$$

$$= \frac{-\sin\frac{\pi}{5}}{16\sin\frac{\pi}{5}} = -\frac{1}{16}$$

ANSWER-KEY										
Q.	1	2	3	4	5	6	7	8	9	10
A.	B	A	B	D	C	B	A	A	C	C
Q.	11	12	13	14	15	16	17	18	19	20
A.	A	A	B	B	B	D	B	B	C	D

SESSION : 2025-26

DPP
DAILY PRACTICE PROBLEMS

Class : XIth
Date :

Solutions

Subject : MATHS
DPP No. :9

Topic :-TRIGONOMETRIC FUNCTIONS

1 **(c)**

$\operatorname{cosec} 15° + \sec 15° = \dfrac{2(\sin 15° + \cos 15°)}{2\sin 15° \cos 15°}$

$= 2\left[\dfrac{\sqrt{3}}{2\sqrt{2}} - \dfrac{1}{2\sqrt{2}} + \dfrac{\sqrt{3}}{2\sqrt{2}} + \dfrac{1}{2\sqrt{2}}\right] / \sin 30°$

$= \dfrac{4\sqrt{3}}{\sqrt{2}} = 2\sqrt{6}$

2 **(d)**

We have, $\sin A = \frac{4}{5}$ and $\cos B = -\frac{12}{13}$

Now, $\cos(A+B) = \cos A \cos B - \sin A \sin B$

$= \sqrt{1 - \dfrac{16}{25}}\left(-\dfrac{12}{13}\right) - \dfrac{4}{5}\sqrt{1 - \dfrac{144}{169}}$

$= -\dfrac{3}{5} \times \dfrac{12}{13} - \dfrac{4}{5}\left(-\dfrac{5}{13}\right)$

$= -\dfrac{36}{65} + \dfrac{20}{65} = -\dfrac{16}{65}$

3 **(a)**

Given that, $\frac{1}{\tan\theta} + \tan\theta = m$

$\Rightarrow 1 + \tan^2\theta = m\tan\theta$

$\Rightarrow \sec^2\theta = m\tan\theta \quad$ ...(i)

and $\sec\theta - \cos\theta = n$

$\Rightarrow \sec^2\theta - 1 = n\sec\theta$

$\Rightarrow \tan^2\theta = n\sec\theta$

$\Rightarrow \tan^4\theta = n^2\sec^2\theta = n^2 \cdot m\tan\theta$ [from Eq.(i)]

$\Rightarrow \tan^3\theta = n^2 m \quad (\because \tan\theta \neq 0)$

$\Rightarrow \tan\,\theta = (n^2 m)^{1/3} \quad$ ...(ii)

From Eq. (i), we get

$\sec^2\theta = m\,(n^2m)^{1/3}$

As we know that, $\sec^2\theta - \tan^2\theta = 1$

$\Rightarrow m(mn^2)^{1/3} - (n^2m)^{2/3} = 1$

$\Rightarrow m(mn^2)^{1/3} - n(nm^2)^{1/3} = 1$

4 **(c)**

We have,

$(\sin A + \sin B + \sin C)(\sin A + \sin B - \sin C) = 3\sin A\sin B$

$\Rightarrow (\sin A + \sin B)^2 - \sin^2 C = 3\sin A\sin B$

$\Rightarrow \sin^2 A + \sin^2 B - \sin^2 C = \sin A\sin B$

$\Rightarrow \sin^2 A + \sin(B+C)\sin(B-C) = \sin A\sin B$

$\Rightarrow \sin^2 A + \sin A\sin(B-C) = \sin A\sin B$

$\Rightarrow \sin A[\sin(B+C) + \sin(B-C)] = \sin A\sin B$

$\Rightarrow 2\sin A\sin B\cos C = \sin A\sin B$

$\Rightarrow \cos C = 1/2 \qquad [\because \sin A\sin B \neq 0]$

$\Rightarrow C = 60°$

5 **(b)**

Given, $\cos 2x + 7 = a\,(2 - \sin x)$

$\Rightarrow \; 1 - 2\sin^2 x + 7 = 2a - a\sin x$

$\Rightarrow \; 2\sin^2 x - a\sin x + (2a - 8) = 0$

$\therefore \; \sin x = \dfrac{a \pm \sqrt{(-a)^2 - 8(2a-8)}}{2 \times 2}$

$= \dfrac{a \pm (a-8)}{4}$

For $(+)$ sign,

$\sin x = \dfrac{a-4}{2}$

For $(-)$ sign,

$\sin x = 2$ which is not possible

We know $-1 \leq \sin x \leq 1$

$\therefore \; -1 \leq \dfrac{a-4}{2} \leq 1 \quad \Rightarrow \quad 2 \leq a \leq 6$

6 **(c)**

$\cos^2 B + \cos^2 C = \cos^2 B + \cos^2\left(\dfrac{\pi}{2} - B\right)$

$= \cos^2 B + \sin^2 B = 1$

7 **(d)**

We have,

$b^2\sin 2\,C + c^2\sin 2\,B$

$= b^2\cdot(2\sin C\cos C) + c^2\cdot(2\sin B\cos B)$

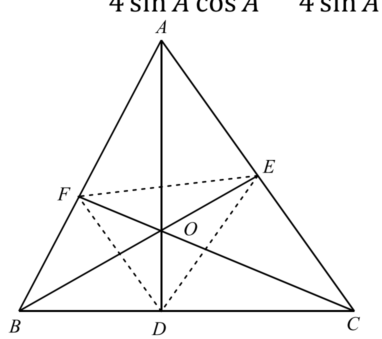
$= 2(b\sin C)(b\cos C) + 2(c\sin B)(c\cos B)$
$= 2(c\sin B)(b\cos c) + 2(c\sin B)(c\cos B)$
$\left[\because \dfrac{b}{\sin B} = \dfrac{c}{\sin C}\right]$
$= 2\,c\sin B(b\cos C + c\cos B) = 2\,ac\sin B = 4\,\Delta$

8 **(a)**

Since the angles of ΔABC are in A.P.
$\therefore 2B = A + C \Rightarrow 3B = A + B + C \Rightarrow 3B = 180° \Rightarrow B = 60°$
Now, $\dfrac{\sin A}{a} = \dfrac{\sin B}{b}$
$\Rightarrow \sin A = \dfrac{a}{b}\sin B = \dfrac{24}{22}\sin 60° = \dfrac{6\sqrt{3}}{11}$
$\Rightarrow \cos A = \dfrac{\sqrt{13}}{11}$
We have,
$\sin C = \sin\{180° - (A + B)\}$
$\Rightarrow \sin C = \sin(A + B)$
$\Rightarrow \sin C = \sin A\cos B + \cos A\sin B$
$\Rightarrow \sin C = \left(\dfrac{6\sqrt{3}}{11}\right)\left(\dfrac{1}{2}\right) + \dfrac{\sqrt{13}}{11}\left(\dfrac{\sqrt{3}}{2}\right) = \dfrac{6\sqrt{3} + \sqrt{39}}{22}$
$\therefore c = \dfrac{b\sin C}{\sin B} \Rightarrow c = 12 + 2\sqrt{13}$

9 **(a)**

We have, $\angle BFC = \frac{\pi}{2} = \angle BEC$
So, the circle with BC as diameter will pass through E and F. Clearly, the circle with BC as diameter is the circumcircle of ΔBEF such that $\angle FBE = 90° - A$
$\therefore FE = 2\left(\dfrac{a}{2}\right)\sin\angle FBE$ [Using : $a = 2R\sin A$]
$\Rightarrow FE = a\cos A$
Let R_1 be the radius of the circumcircle of ΔDEF. Then,
$R_1 = \dfrac{FE}{2\sin\angle FDE} = \dfrac{a\cos A}{2\sin(180° - 2A)}$
$\Rightarrow R_1 = \dfrac{a\cos A}{4\sin A\cos A} = \dfrac{a}{4\sin A} = \dfrac{R}{2}$



10 **(b)**

Clearly, the equation $x^2 + \sqrt{2}x + 1 = 0$ has imaginary roots. So, the two equations have both common roots

$\therefore \frac{a}{1} = \frac{b}{\sqrt{2}} = \frac{c}{1}$

$\Rightarrow \frac{\sin A}{1} = \frac{\sin B}{\sqrt{2}} = \frac{\sin C}{1}$

$\Rightarrow \frac{\sin A}{1/\sqrt{2}} = \frac{\sin B}{1} = \frac{\sin C}{1/\sqrt{2}}$

$\Rightarrow A = \frac{\pi}{4}, B = \frac{\pi}{2}, C = \frac{\pi}{4}$

11 **(a)**

We have,

$s = \frac{3a}{2}$ and $\Delta = \frac{\sqrt{3}}{4}a^2 \ \therefore r = \frac{\Delta}{s} = \frac{a}{2\sqrt{3}}$

Let the length of each side of the square inscribed in the incircle be x. Then,

$x^2 + x^2 = (\text{Diameter})^2$

$\Rightarrow 2x^2 = \frac{a^2}{3} \Rightarrow x^2 = \frac{a^2}{6} \Rightarrow$ Area of the square $= \frac{a^2}{6}$

12 **(a)**

$\cos 1°. \cos 2° \ldots\ldots \cos 179°$

$= \cos 1°. \cos 2° \ldots\ldots \cos 90°. \cos 179°$

$= 0 \quad [\because \cos 90° = 0]$

13 **(a)**

Given equation is

$2^{\cos 2x} + 1 = 3.2^{-\sin x}$

By taking option (a)

Let $x = n\pi$

When, $n = 1,\ x = \pi$

$\therefore \quad 2^{\cos 2\pi} + 1 = 3.2^{-\sin \pi}$

$\Rightarrow \quad 2 + 1 = 3.2° \quad \Rightarrow \quad 3 = 3$

When $n = 2, x = 2\pi$

$\therefore \quad 2^{\cos 4\pi} + 1 = 3.2^{-\sin 2\pi}$

$\Rightarrow \quad 2^1 + 1 = 3.2°$

$\Rightarrow \quad 3 = 3$

14 **(b)**

On squaring given equation, we get

$\sin^2 A + 6\cos^2 A - 2\sqrt{6}\sin A \cos A = 7\cos^2 A$

$\Rightarrow \ \sin^2 A + 6(1 - \sin^2 A) = \cos^2 A + 6\cos^2 A + 2\sqrt{6}\sin A \cos A$

$\Rightarrow \sin^2 A - 6\cos^2 A + 6 = \cos^2 A + 6\sin^2 A + 2\sqrt{6}\sin A \cos A$

$\Rightarrow \ 7\sin^2 A = \left(\cos A + \sqrt{6}\sin A\right)^2$

$\Rightarrow \ \pm\sqrt{7}\sin A = \cos A + \sqrt{6}\sin A$

Alternate

Given, $\sin A - \sqrt{6}\cos A = \sqrt{7}\cos A$
Replacing A by $90° + A$, we get
$\sin(90° + A) - \sqrt{6}\cos(90° + A)$
$= \sqrt{7}\cos(90° + A)$
$\Rightarrow \cos A + \sqrt{6}\sin A = -\sqrt{7}\sin A$

15 **(b)**

We have,

$$y = \frac{\tan x}{\tan 3x}$$

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

$\Rightarrow 3y - y\tan^2 x = 1 - 3\tan^2 x$
$\Rightarrow \tan^2 x\,(y - 3) = 1 - 3y$

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

$$\Rightarrow -\frac{y-3}{3y-1} \geq 0 \;\; [\because \tan^2 x \geq 0]$$

$$\Rightarrow \frac{y-3}{3y-1} \leq 0 \Rightarrow \frac{1}{3} \leq y < 3 \Rightarrow y \in [1/3,3]$$

16 **(c)**

We have, $\sqrt{\operatorname{cosec}^2\alpha + 2\cot\alpha}$

$$= \sqrt{1 + \cot^2\alpha + 2\cot\alpha} = |1 + \cot\alpha|$$

But $\frac{3\pi}{4} < \alpha < \pi$

$\Rightarrow \cot\alpha < -1 \;\Rightarrow 1 + \cot\alpha < 0$

Hence, $|1 + \cot\alpha| = -(1 + \cot\alpha)$

17 **(c)**

Since $-\sqrt{a^2 + b^2} \leq a\sin x + b\cos x \leq \sqrt{a^2 + b^2}$. Therefore, $a\sin x + b\cos x = c$ has no solution for $|c| > \sqrt{a^2 + b^2}$

18 **(c)**

We have,
$\tan\theta + \sec\theta = 2\cos\theta$
$\Rightarrow 1 + \sin\theta = 2\cos^2\theta$
$\Rightarrow 1 + \sin\theta = 2 - 2\sin^2\theta$
$\Rightarrow 2\sin^2\theta + \sin\theta - 1 = 0$
$\Rightarrow (2\sin\theta - 1)(\sin\theta + 1) = 0$

$$\Rightarrow \sin\theta = \frac{1}{2}, \sin\theta = -1$$

$\Rightarrow \sin\theta = \frac{1}{2} \quad \left[\begin{array}{c} \because \sin\theta = -1 \Rightarrow \theta = \frac{3\pi}{2} \\ \text{for which the equation is not defined} \end{array}\right]$

$\Rightarrow \theta = \frac{\pi}{6}, \frac{5\pi}{6} \qquad [\because \theta \in [0, 2\pi]]$

Hence, the given equation has two solutions in $[0, 2\pi]$

19 **(c)**

Given, $\sin \pi(x^2 + x) - \sin \pi x^2 = 0$

$\Rightarrow \; 2\cos\pi\left(\frac{2x^2 + x}{2}\right)\sin\frac{\pi x}{2} = 0$

$\Rightarrow \; \pi\left(\frac{2x^2 + x}{2}\right) = n\pi + \frac{\pi}{2}$

$\Rightarrow \; 2x^2 + x = 2n + 1$

$\Rightarrow \; 2x^2 + x - p' = 0$, where $p' = 2n + 1$, is an odd integer

$\therefore \; x = \frac{-1 \pm \sqrt{1 + 8p'}}{4}$ [put $1 + 8p' = p$]

$\therefore \; x = \frac{-1 \pm \sqrt{p}}{4} \; \Rightarrow \; x = \frac{\sqrt{p} - 1}{4} \quad \left[\text{neglect } x = \frac{-1 - \sqrt{p}}{4}\right]$

20 **(b)**

Given that, $3\sin^2 A + 2\sin^2 B = 1$ ...(i)

and $3\sin 2A - 2\sin 2B = 0$ ...(ii)

From Eq. (i)

$3\left(\frac{1 - \cos 2A}{2}\right) + 2\left(\frac{1 - \cos 2B}{2}\right) = 1$

$\Rightarrow \; 3\cos 2A + 2\cos 2B = 3$ ...(iii)

$\Rightarrow \; 3\cos 2A = 3 - 2\cos 2B$

$\Rightarrow \; 9\cos^2 2A = 9 + 4\cos^2 2B - 12\cos 2B$

$\Rightarrow \; 9(1 - \sin^2 2A) = 9 + 4\cos^2 2B - 12\cos 2B$

$\Rightarrow \; 9 - 4\sin^2 2B = 9 + 4\cos^2 2B - 12\cos 2B$ [from Eq. (ii)]

$\Rightarrow \; -4(1 - \cos^2 2B) = 4\cos^2 2B - 12\cos 2B$

$\Rightarrow \; -4 = -12\cos 2B$

$\Rightarrow \; \cos 2B = \frac{1}{3}$

Now, from Eq. (iii)

$\cos 2A = \frac{7}{9} \; \Rightarrow \; 2\cos^2 A - 1 = \frac{7}{9}$

$\Rightarrow \; \cos A = \frac{2\sqrt{2}}{3}$

$\therefore \; A + 2B = \cos^{-1}\frac{2\sqrt{2}}{3} + \cos^{-1}\frac{1}{3}$

$= \cos^{-1}\left(\frac{2\sqrt{2}}{3}\cdot\frac{1}{3} - \sqrt{1 - \frac{8}{9}}\sqrt{1 - \frac{1}{9}}\right)$

$$= \cos^{-1}\left(\frac{2\sqrt{2}}{9} - \frac{2\sqrt{2}}{9}\right)$$

$$= \cos^{-1}(0) = \frac{\pi}{2}$$

ANSWER-KEY										
Q.	1	2	3	4	5	6	7	8	9	10
A.	C	D	A	C	B	C	D	A	A	B
Q.	11	12	13	14	15	16	17	18	19	20
A.	A	A	A	B	B	C	C	C	C	B

SESSION : 2025-26

DPP
DAILY PRACTICE PRACTICE PROBLEMS

Class : XIth
Date :

Solutions

Subject : MATHS
DPP No. :10

Topic :-TRIGONOMETRIC FUNCTIONS

1 **(b)**

Let $f(x) = \sin x \cos x = \frac{1}{2}\sin 2x$

We know that, $-1 \leq \sin 2x \leq 1$

$\Rightarrow\ -\frac{1}{2} \leq \frac{1}{2}\sin 2x \leq \frac{1}{2}$

Thus, the greatest and least value of $f(x)$ are $\frac{1}{2}$ and $\frac{1}{2}$ respectively

2 **(b)**

We have,
$x^2 + 4xy + y^2$
$= (X\cos\theta - Y\sin\theta)^2 + 4(X\cos\theta - Y\sin\theta)(X\sin\theta + Y\cos\theta) + (X\sin\theta + Y\cos\theta)^2$
$= (1 + 4\sin\theta\cos\theta)X^2 + 4(\cos^2\theta - \sin^2\theta)XY + (1 - 4\sin\theta\cos\theta)Y^2$
$\therefore x^2 + 4xy + y^2 = AX^2 + BY^2$
$\Rightarrow (1 + 2\sin 2\theta)X^2 + 4\cos 2\theta\, XY + (1 - 2\sin 2\theta)Y^2$
$= AX^2 + BY^2$
$\Rightarrow \cos 2\theta = 0, A = 1 + 2\sin 2\theta, B = 1 - 2\sin 2\theta$
$\Rightarrow \theta = \dfrac{\pi}{4}$ and $A = 1 + 2 = 3, B = 1 - 2 = -1$

3 **(d)**

Given, $3\cos 2x - 10\cos x + 7 = 0$
$\Rightarrow\ \ 6\cos^2 x - 10\cos x + 4 = 0$
$[\because \cos 2x = 2\cos^2 x - 1]$
$\Rightarrow\ \ 2(3\cos x - 2)(\cos x - 1) = 0$
$\Rightarrow\ \ \cos x = 1$ or $\cos x = \frac{2}{3}$
Since, $\cos x$ is positive in Ist and IIIrd quadrant.
Hence, total number of solutions are 4

4 **(a)**

$\cos\alpha\sin(\beta - \gamma) + \cos\beta\sin(\gamma - \alpha) + \cos\gamma\sin(\alpha - \beta)$
$=\cos\alpha\,[\sin\beta\cos\gamma - \cos\beta\sin\gamma] + \cos\beta[\sin\gamma\cos\alpha - \cos\gamma\sin\alpha] + \cos\gamma[\sin\alpha\cos\beta - \cos\alpha\sin\beta]$
$= 0$

5 **(d)**

Given, $A + B = 45°$

$\Rightarrow \cot(A + B) = 1$

$\Rightarrow \dfrac{\cot A \cot B - 1}{\cot A + \cot B} = 1$

$\Rightarrow \cot A cot\ B - (\cot A + \cot B) = 1 \quad ...(i)$

Now, $(\cot A - 1)(\cot B - 1) = \cot A \cot B - (\cot A + \cot B) + 1$

$= 1 + 1 = 2$ [from Eq. (i)]

6 **(c)**

Let $I = [\sin x + \cos x]^{1+\sin 2x}$

$= \left[\sqrt{2}\sin\left(\dfrac{\pi}{4} + x\right)\right]^{1+\sin 2x}$

At $x = \frac{\pi}{4}$,

$I = \left[\sqrt{2}\sin\left(\dfrac{\pi}{4} + \dfrac{\pi}{4}\right)\right]^{1+\sin\frac{2\pi}{4}}$

$= \left(\sqrt{2}\right)^2 = 2$

7 **(d)**

The given expression can be written as

$\cos^6 x\,(\cos^6 x + 3\cos^4 x + 3\cos^2 x + 1) + 2\cos^4 x + \cos^2 x - 2$

$= \sin^3 x\,(\cos^2 x + 1)^3 + 2\cos^4 x + \cos^2 x - 2$

$= \sin^3 x\,(\sin x + 1)^3 + 2\sin^2 x + \cos^2 x - 2$

$[\because \sin x + \sin^2 x = 1 \Rightarrow \sin x = \cos^2 x]$

$= (\sin x + \sin^2 x)^3 + \sin^2 x + (\sin^2 x + \cos^2 x) - 2$

$= 1^3 + \sin^2 x + 1 - 2 = \sin^2 x$

8 **(b)**

$\sin^4\dfrac{\pi}{8} + \sin^4\dfrac{3\pi}{8} + \sin^4\dfrac{5\pi}{8} + \sin^4\dfrac{7\pi}{8}$

$= \dfrac{1}{4}\left[\left(2\sin^2\dfrac{\pi}{8}\right)^2 + \left(2\sin^2\dfrac{3\pi}{8}\right)^2\right] + \dfrac{1}{4}\left[\left(2\sin^2\dfrac{\pi}{8}\right)^2 + \left(2\sin^2\dfrac{3\pi}{8}\right)^2\right]$

$= \dfrac{1}{4}\left[\left(1 - \cos\dfrac{\pi}{4}\right)^2 + \left(1 - \cos\dfrac{3\pi}{4}\right)^2\right] + \dfrac{1}{4}\left[\left(1 - \cos\dfrac{\pi}{4}\right)^2 + \left(1 - \cos\dfrac{3\pi}{4}\right)^2\right]$

$= \dfrac{1}{4}\left[\left(1 - \dfrac{1}{\sqrt{2}}\right)^2 + \left(1 + \dfrac{1}{\sqrt{2}}\right)^2\right] + \dfrac{1}{4}\left[\left(1 - \dfrac{1}{\sqrt{2}}\right)^2 + \left(1 + \dfrac{1}{\sqrt{2}}\right)^2\right]$

$= \dfrac{1}{4}(3) + \dfrac{1}{4}(3) = \dfrac{3}{2}$

9 **(c)**

Given, $\frac{\sin(x+3\alpha)}{\sin(\alpha - x)} = 3$

Applying componendo and dividendo, we get

$$\frac{\sin(x+3\alpha)+\sin(\alpha-x)}{\sin(x+3\alpha)-\sin(\alpha-x)}=\frac{3+1}{3-1}$$

$$\Rightarrow\ \frac{2\sin 2\alpha\cos(\alpha+x)}{2\cos 2\alpha\sin(\alpha+x)}=2$$

$$\Rightarrow\ \frac{\tan 2\alpha}{\tan(\alpha+x)}=2$$

$$\Rightarrow\ \frac{2\tan\alpha}{1-\tan^2\alpha}\times\frac{(1-\tan\alpha\tan x)}{(\tan\alpha+\tan x)}=2$$

$\Rightarrow\ \tan\alpha-\tan^2\alpha\tan x=\tan\alpha+\tan x-\tan^3\alpha-\tan^2\alpha\tan x$

$\Rightarrow\ \tan x=\tan^3\alpha$

10 **(a)**

We have,

$\cos\alpha\sin(\beta-\gamma)+\cos\beta\sin(\gamma-\beta)+\cos\gamma\sin(\alpha-\beta)$

$$=\frac{1}{2}\{\sin(\alpha+\beta-\gamma)+\sin(\beta-\gamma-\alpha)+\sin(\gamma-\alpha+\beta)+\sin(\gamma-\alpha-\beta)+\sin(\alpha-\beta+\gamma)+\sin(\alpha-\beta-\gamma)\}$$

$$=\frac{1}{2}\{\sin(\alpha+\beta-\gamma)-\sin(\alpha-\beta+\gamma)-\sin(\alpha-\beta-\gamma)-\sin(\alpha+\beta-\gamma)+\sin(\alpha-\beta+\gamma)+\sin(\alpha-\beta-\gamma)\}$$

$$=\frac{1}{2}\times 0=0$$

11 **(c)**

$\sin A+\cos A=m$ [given]

$\Rightarrow\ \sin^3 A+\cos^3\ A+3\cos A\sin A$

$(\sin A+\cos A)=m^3$

$\Rightarrow\ n+3m\sin A\cos A=m^3$ ....(i)

$[\because \sin^3 A+\cos^3 A=n]$

Again, $\sin A+\cos A=m$

$\Rightarrow\ \sin^2 A+\cos^2 A+2sin\ A\cos A=m^2$

$\Rightarrow\ \sin A\cos A=\frac{m^2-1}{2}$ ...(ii)

From Eqs. (i) and (ii), we get

$$n+3m\frac{(m^2-1)}{2}=m^3$$

$\Rightarrow\ 2n+3m^3-3m=2m^3$

$\Rightarrow\ m^3-3m+2n=0$

12 **(b)**

We have,

$(\sec\theta-1)=\left(\sqrt{2}-1\right)\tan\theta$

$\Rightarrow 1-\cos\theta=\left(\sqrt{2}-1\right)\sin\theta$

$$\Rightarrow 2\sin^2\frac{\theta}{2}=2\left(\sqrt{2}-1\right)\sin\frac{\theta}{2}\cos\frac{\theta}{2}$$

$$\Rightarrow \sin\frac{\theta}{2}=0 \text{ or}, \tan\frac{\theta}{2}=\sqrt{2}-1=\tan\frac{\pi}{8}$$

$\Rightarrow \dfrac{\theta}{2} = n\,\pi$ or, $\dfrac{\theta}{2} = n\,\pi + \dfrac{\pi}{8}, n \in Z$

$\Rightarrow \theta = 2\,n\,\pi, \theta = 2\,n\,\pi + \dfrac{\pi}{4}, n \in Z$

13 **(d)**

Given, $\cos\theta + \sin 2\theta = 0$

$\Rightarrow \cos\theta + 2\sin\theta\cos\theta = 0$

$\Rightarrow \cos\theta(1 + 2\sin\theta) = 0$

$\Rightarrow \cos\theta = 0$ or $\sin\theta = -\frac{1}{2}$

For $\theta \in [-\pi, \pi]$

$\theta = \dfrac{\pi}{2}, -\dfrac{\pi}{2}$

Or $\theta = -\frac{\pi}{6}, -\frac{5\pi}{6}$

14 **(b)**

We have,

$\tan\left(\dfrac{\pi}{2}\sin\theta\right) = \cot\left(\dfrac{\pi}{2}\cos\theta\right)$

$\Rightarrow \tan\left(\dfrac{\pi}{2}\sin\theta\right) = \tan\left(\dfrac{\pi}{2} - \dfrac{\pi}{2}\cos\theta\right)$

$\Rightarrow \dfrac{\pi}{2}\sin\theta = r\,\pi + \dfrac{\pi}{2} - \dfrac{\pi}{2}\cos\theta,\ r \in Z$

$\Rightarrow \sin\theta + \cos\theta = (2r + 1), r \in Z$

$\Rightarrow \dfrac{1}{\sqrt{2}}\sin\theta + \dfrac{1}{\sqrt{2}}\cos\theta = \dfrac{2r+1}{\sqrt{2}}, r \in Z$

$\Rightarrow \cos\left(\theta - \dfrac{\pi}{4}\right) = \dfrac{2r+1}{\sqrt{2}}, r \in Z$

$\Rightarrow \cos\left(\theta - \dfrac{\pi}{4}\right) = \dfrac{1}{\sqrt{2}}$ or $-\dfrac{1}{\sqrt{2}}$ [For $r = 0, -1$]

$\Rightarrow \theta - \dfrac{\pi}{4} = 2\,r\,\pi \pm \dfrac{\pi}{4}, r \in Z$

$\Rightarrow \theta = 2\,r\,\pi \pm \dfrac{\pi}{4} + \dfrac{\pi}{4}, r \in Z$

$\Rightarrow \theta = 2\,r\,\pi, 2\,r\,\pi + \dfrac{\pi}{2}, r \in Z$

But, $\theta = 2\,r\,\pi + \frac{\pi}{2}, r \in Z$ gives extraneous roots as it does not satisfy the given equation. Therefore,

$\theta = 2\,r\,\pi, r \in Z$

15 **(b)**

$\tan\theta + \tan\left(\dfrac{3\pi}{4} + \theta\right) = 2$

$\Rightarrow \tan\theta + \tan\left(\dfrac{\pi}{2} + \left(\dfrac{\pi}{4} + \theta\right)\right) = 2$

$\Rightarrow \tan\theta - \cot\left(\dfrac{\pi}{4} + \theta\right) = 2$

$\Rightarrow \tan\theta - \dfrac{\cot\frac{\pi}{4}\cot\theta - 1}{\cot\frac{\pi}{4} + \cot\theta} = 2$

$\Rightarrow\ \tan\theta - \dfrac{\cot\theta - 1}{1+\cot\theta} = 2$

$\Rightarrow\ \tan\theta - \dfrac{1-\tan\theta}{1+\tan\theta} = 2$

$\Rightarrow\ \tan\theta + \tan^2\theta - 1 + \tan\theta = 2 + 2\tan\theta$

$\Rightarrow\ \tan^2\theta = 3$

$\Rightarrow\ \tan\theta = \pm\sqrt{3} = \pm\tan\dfrac{\pi}{3}$

$\Rightarrow\ \theta = n\pi \pm \dfrac{\pi}{3}, n \in Z$

16 **(b)**

We have,

$(1+\tan\theta)(1+\tan\phi) = 2$

$\Rightarrow 1 + \tan\theta + \tan\phi + \tan\theta\tan\phi = 2$

$\Rightarrow \tan\theta + \tan\phi = 1 - \tan\theta\tan\phi$

$\Rightarrow \dfrac{\tan\theta+\tan\phi}{1-\tan\theta\tan\phi} = 1$

$\Rightarrow \tan(\theta+\phi) = 1 \Rightarrow \theta+\phi = \dfrac{\pi}{4}, n \in Z$

17 **(c)**

Given, $2\sec 2\alpha = \tan\beta + \cot\beta$

$\Rightarrow\ 2\sec 2\alpha = \dfrac{\sin^2\beta + \cos^2\beta}{\sin\beta\cos\beta}$

$\Rightarrow\ \dfrac{2}{\cos 2\alpha} = \dfrac{1}{\sin\beta\cos\beta}$

$\Rightarrow\ \sin 2\beta = \cos 2\alpha$

$\Rightarrow\ \alpha + \beta = \dfrac{\pi}{4}$

18 **(a)**

We have,

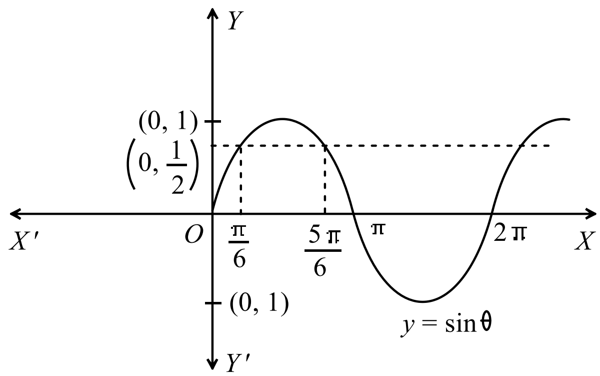
$2\sin^2\theta - 5\sin\theta + 2 > 0$

$\Rightarrow (\sin\theta - 2)(2\sin\theta - 1) > 0$

$\Rightarrow 2\sin\theta - 1 < 0 \quad [\because -1 \le \sin\theta \le 1 \quad \therefore \sin\theta - 2 < 0]$

$\Rightarrow \sin\theta < \dfrac{1}{2}$

$\Rightarrow \theta \in (0, \pi/6) \cup (5\pi/6, \pi)$



19 **(d)**

Given that,

$\tan A - \tan B = x \quad \ldots \text{(i)}$

and $\cot B - \cot A = y \quad \ldots \text{(ii)}$

Now, $\cot(\mathrm{A}-\mathrm{B}) = \frac{1}{\tan(\mathrm{A}-\mathrm{B})}$

$= \dfrac{1+\tan A \tan B}{\tan A - \tan B}$

$= \dfrac{1}{\tan A - \tan B} + \dfrac{\tan A \tan B}{\tan A - \tan B}$

$= \frac{1}{x} + \frac{1}{y}$ [from Eqs.(i)and(ii)]

20 **(b)**

We have,

$\dfrac{a\cos B - b\cos A}{a-b}$

$= \dfrac{a\left(\frac{c^2+a^2-b^2}{2ac}\right) - b\left(\frac{b^2+c^2-a^2}{2bc}\right)}{a-b}$

$= \dfrac{2(a^2-b^2)}{2c(a-b)} = \dfrac{a+b}{c} = \dfrac{2c}{c} = 2 \quad \begin{bmatrix} \because a, c, b \text{ are in A. P.} \\ \therefore a+b=2c \end{bmatrix}$

ANSWER-KEY										
Q.	1	2	3	4	5	6	7	8	9	10
A.	B	B	D	A	D	C	D	B	C	A

Q.	11	12	13	14	15	16	17	18	19	20
A.	C	B	D	B	B	B	C	A	D	B