

Foundation Batch



MATHS

Trigonometry

Minima & Maxima

Part -12

LIVE

15-11-2024 07:00PM





Minima & Maxima

	min.	max.	
$\sin \theta$	-1	+1	}
$\cos \theta$	-1	+1	
$\tan \theta$	$-\infty$	$+\infty$	
$\cot \theta$	$-\infty$	$+\infty$	
$\sec \theta$	$-\infty$	$+\infty$	(except -1 to +1)
$\csc \theta$	$-\infty$	$+\infty$	"

	min.	max.
$\sin^2 \theta$	0	+1
$\cos^2 \theta$	0	+1
$\tan^2 \theta$	0	∞
$\cot^2 \theta$	0	∞
$\sec^2 \theta$	1	∞
$\operatorname{cosec}^2 \theta$	1	∞

Q $4 + \sin \theta < \overset{-1}{+1}$

$$\text{min.} = ?$$

$$\text{max.} = ?$$

$$4 - 1 = 3 \rightarrow \text{min}$$

$$4 + 1 = 5 \rightarrow \text{max.}$$

$$8 - \cos \alpha < \begin{matrix} -1 \\ +1 \end{matrix}$$

$$\text{min.} = ?$$

$$\text{max.} = ?$$

$$8 - (-1) = 9 \rightarrow \text{max}$$

$$8 - (1) = 7 \rightarrow \text{min}$$

$$4 + \sin^2 \theta \quad \begin{array}{l} \text{max} = ? \\ \text{min} = ? \end{array}$$

$$4 + 0 = 4 \rightarrow \text{min.}$$

$$4 + 1 = 5 \rightarrow \text{max.}$$

$$7 + \tan^2 \theta$$

$$\text{min} = ? = 7$$

$$\text{max} = ? = \infty$$

$$7 + 0 = 7$$

$$7 + \infty = \infty$$

$$x = \pm \underline{a} \sin \theta \pm \underline{b} \cos \theta$$

min.

max.

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

$$+\sqrt{a^2 + b^2}$$



$$Y = a \sin \theta + b \cos \theta$$

Min.

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

Max.

$$+\sqrt{a^2 + b^2}$$

144. Find the min. and max. value of the following expressions.

निम्नलिखित व्यंजकों का न्यूनतम और अधिकतम मान ज्ञात कीजिए।

$$7\sin \theta - 24\cos \theta$$

(a) 7, 24

(b) -25, 25

(c) -7, 24

(d) -25, 0

$$\text{min} = -\sqrt{7^2 + 24^2} = -\sqrt{625} = -25$$

$$\text{max} = +\sqrt{7^2 + 24^2} = +25$$



145. The maximum value of $(2\sin \theta + 3\cos \theta)$ is:
 $(2\sin \theta + 3\cos \theta)$ का अधिकतम मान ज्ञात कीजिए।

(a) $\sqrt{17}$

(b) $\sqrt{11}$

(c) 9

(d) $\sqrt{13}$

$$+ \sqrt{2^2 + 3^2}$$

$$+ \sqrt{4 + 9}$$

$$= +\sqrt{13}$$

(SSC CGL 2024 PRE)



146. What is the maximum value of

$$7\cos A + 24\sin A + 32$$

$7\cos A + 24\sin A + 32$ का अधिकतम मान क्या है?

(a) 32

(b) 39

(c) 25

(d) 57

$$\sqrt{7^2 + 24^2} + 32$$

$$+25 + 32$$

$$= 57$$

min. value

$$-25 + 32$$

$$= +7$$

(SSC-CHSL Pre. 09/07/2024)

147. Find the maximum value of $19\sin\theta + 6\cot\theta\sin\theta$

$19\sin\theta + 6\cot\theta\sin\theta$ का अधिकतम मान ज्ञात कीजिए

(a) $\sqrt{297}$

(b) $\sqrt{397}$

(c) $\sqrt{197}$

(d) $\sqrt{497}$

$$19\sin\theta + 6 \times \frac{\cos\theta}{\sin\theta} \times \sin\theta$$

$$19\sin\theta + 6\cos\theta$$

$$\max = +\sqrt{19^2 + 6^2}$$

(SSC-CPO Pre. 27/06/2024)

$$\sqrt{361 + 36}$$

$$\sqrt{397}$$

148. Find the min. and max. value of $5\sin \theta + 12\cos \theta - 3$.

$5\sin \theta + 12\cos \theta - 3$ का न्यूनतम और अधिकतम मान ज्ञात कीजिए।

~~(a) $-16, 10$~~

~~(b) $-13, 13$~~

~~(c) $-16, 16$~~

~~(d) $10, 13$~~

$$\pm \sqrt{5^2 + 12^2}$$

$$\pm \sqrt{169}$$

$$\pm 13 - 3$$

$$13 - 3$$

$$-13 - 3$$

max. $\textcircled{16}$

$\textcircled{-16}$ min



149. Find max & min value $8^{\sin \theta} \cdot 16^{\cos \theta}$

$8^{\sin \theta} \cdot 16^{\cos \theta}$ का अधिकतम और न्यूनतम मान ज्ञात करें

(a) 1, -1

(b) 1, 0

(c) 16, $\frac{1}{16}$

(d) 32, $\frac{1}{32}$

$$(2^3)^{\sin \theta} \cdot (2^4)^{\cos \theta}$$

$$2^{3 \sin \theta} \cdot 2^{4 \cos \theta}$$

$$= 2^{3 \sin \theta + 4 \cos \theta}$$

$$2^{\pm \sqrt{3^2 + 4^2}} = 2^{\pm \sqrt{25}} = 2^{\pm 5}$$

$$32 = 2^5 \cdot 2^{-5} = \frac{1}{32}$$

$$2^{-5} = \frac{1}{2^5}$$



150. Find max & min value of $x^{12\sin \theta} \cdot x^{5\cos \theta}$.

$x^{12\sin \theta} \cdot x^{5\cos \theta}$ का अधिकतम और न्यूनतम मान ज्ञात कीजिए।

$$12\sin \theta + 5\cos \theta$$

$$x$$

(a) x^{12}, x^5

~~(b) x^{13}, x^{-13}~~

(c) $x^{12}, 0$

(d) $x^{13}, 0$

$$\pm \sqrt{12^2 + 5^2}$$

$$x^{\pm \sqrt{169}} = x^{\pm 13}$$
$$\underbrace{x^{13} \quad x^{-13}}$$



151. Find minimum and maximum value of $16^{\sin \theta} \cdot 4^{\sin \theta} \cdot 2^{\cos \theta} \cdot 128^{\cos \theta}$

$16^{\sin \theta} \cdot 4^{\sin \theta} \cdot 2^{\cos \theta} \cdot \underline{128^{\cos \theta}}$ का न्यूनतम और अधिकतम मान ज्ञात करें

(a) 2, 128

~~(b) $2^{-10}, 2^{10}$~~

(c) $2^{-5}, 2^5$

(d) -1, 1

$$(2^4)^{\sin \theta} \cdot (2^2)^{\sin \theta} \cdot 2^{\cos \theta} \cdot (2^7)^{\cos \theta}$$

$$2^{4\sin \theta} \cdot 2^{2\sin \theta} \cdot 2^{\cos \theta} \cdot 2^{7\cos \theta}$$

$$2^{6\sin \theta + 8\cos \theta}$$

$$2^{\pm \sqrt{6^2 + 8^2}}$$

$$2^{\pm \sqrt{100}} = 2^{\pm 10} \begin{cases} 2^{-10} \\ 2^{+10} \end{cases}$$



152. Find max&min value of $\sin \theta + \cos (\theta + 30^\circ)$

$\sin \theta + \cos (\theta + 30^\circ)$ का अधिकतम और न्यूनतम मान ज्ञात करें

(a) 2, -2

(b) 1, -1

(c) 3, -3

(d) 1, 0

$$\sin \theta + \cos \theta \cdot \cos 30^\circ - \sin \theta \cdot \sin 30^\circ$$

$$\sin \theta + \cos \theta \times \frac{\sqrt{3}}{2} - \sin \theta \times \frac{1}{2}$$

$$\left(1 - \frac{1}{2}\right) \sin \theta + \frac{\sqrt{3}}{2} \cos \theta$$

$$\frac{1}{2} \sin \theta + \frac{\sqrt{3}}{2} \cos \theta$$

$$\pm \sqrt{\left(\frac{1}{2}\right)^2 + \left(\frac{\sqrt{3}}{2}\right)^2}$$

$$\pm \sqrt{\frac{1}{4} + \frac{3}{4}}$$

$$\pm \sqrt{\frac{4}{4}} \Rightarrow \pm 1$$



153. Find max&min value of $\cos \theta + \sin (\theta + 30^\circ)$.

$\cos \theta + \sin (\theta + 30^\circ)$ का अधिकतम और न्यूनतम मान ज्ञात करें।

(a) 1, -1 $\cos \theta + \sin \theta \cdot \cos 30 + \cos \theta \cdot \sin 30$

(b) 2, -2 $\cos \theta + \sin \theta \times \frac{\sqrt{3}}{2} + \cos \theta \times \frac{1}{2}$

(c) 3, -3

(d) $\sqrt{3}, -\sqrt{3}$

$(1 + \frac{1}{2}) \cos \theta + \frac{\sqrt{3}}{2} \sin \theta$

$\frac{3}{2} \cos \theta + \frac{\sqrt{3}}{2} \sin \theta$

$\pm \sqrt{\frac{9}{4} + \frac{3}{4}}$

$\pm \sqrt{\frac{12}{4}}$

$\pm \sqrt{3} \begin{cases} \sqrt{3} \\ -\sqrt{3} \end{cases}$

$$-1 \leq \sin \theta \leq 1$$



$$-1 < \sin n\theta \leq +1$$



$$-1 \leq \sin 2\theta \leq +1$$

154. Find maximum, minimum value of $15 \sin \left(\frac{\theta + \pi}{4} \right) + 20 \cos \left(\frac{\theta + \pi}{4} \right)$.

$15 \sin \left(\frac{\theta + \pi}{4} \right) + 20 \cos \left(\frac{\theta + \pi}{4} \right)$ का अधिकतम, न्यूनतम मान ज्ञात कीजिए।

(a) 25, -25

(b) 15, -15

(c) 20, -20

(d) 17, -17

$$\frac{\theta + \pi}{4} = \alpha$$

$$15 \sin \alpha + 20 \cos \alpha$$

$$\pm \sqrt{15^2 + 20^2}$$

$$\pm \sqrt{625} = \pm 25 \begin{cases} 25 \\ -25 \end{cases}$$

$$a \sin^2 \theta + b \cos^2 \theta$$

If $a > b$

$$\max = a$$

$$\min = b$$

if $b > a$

$$\max = b$$

$$\min = a$$

ex. $10 \sin^2 \theta + 12 \cos^2 \theta$

$$\max = 12$$

$$\min = 10$$

$$8 \sin^2 \theta - 13 \cos^2 \theta$$

$$= 8 \sin^2 \theta + (-13) \cos^2 \theta$$

$$\max = 8$$

$$\min = -13$$



$$Y = a \sin^2 \theta + b \cos^2 \theta$$

Min.

a

b

Max.

b

a

$(a < b)$

$(a > b)$



155. Find minimum and maximum value of $Y = 3\sin^2 \theta + 4\cos^2 \theta$.

$Y = 3\sin^2 \theta + 4\cos^2 \theta$ का न्यूनतम और अधिकतम मान ज्ञात कीजिए।

(a) 0,3

(b) 0,4

~~(c) 3,4.~~

(d) None of these

$$\text{max} = 4$$

$$\text{min} = 3$$

$$3\sin^2 \theta + 3\cos^2 \theta + \cos^2 \theta$$

$$3(\sin^2 \theta + \cos^2 \theta) + \cos^2 \theta$$

$$3 + \cos^2 \theta$$

$$3+0=3$$

$$3+1=4$$



156. Find minimum and maximum value of $3 \sin^2 \theta - 5 \cos^2 \theta$

$3 \sin^2 \theta - 5 \cos^2 \theta$ का न्यूनतम व अधिकतम मान ज्ञात कीजिए।

$$3 \sin^2 \theta + (-5) \cos^2 \theta$$

(a) 3, 5

(b) -5, 3

(c) -3, 5

(d) None of these

$$\max = +3$$

$$\min = -5$$



157. Find max&min value of $4^{\sin^2 \theta} \times 8^{\cos^2 \theta}$.

$4^{\sin^2 \theta} \times 8^{\cos^2 \theta}$ का अधिकतम और न्यूनतम मान ज्ञात कीजिए।

(a) 1, -1

(b) 8, 4

(c) 32, 2

(d) 3, 2

$$\left(2^2\right)^{\sin^2 \theta} \times \left(2^3\right)^{\cos^2 \theta}$$

$$2^{2\sin^2 \theta + 3\cos^2 \theta}$$

$$2^3$$

$$8$$

$$2^2$$

$$4$$



158. Find max & min value of $8\sin^2 \theta 16\cos^2 \theta$

$8\sin^2 \theta 16\cos^2 \theta$ का अधिकतम और न्यूनतम मान ज्ञात करें

(a) 16, 0

(b) 16, -8

(c) 1, -1

(d) 16, 8

$$\left(2^3\right)^{\sin^2 \theta} \cdot \left(2^4\right)^{\cos^2 \theta}$$

$$\frac{3\sin^2 \theta + 4\cos^2 \theta}{2}$$

$$\max = 2^4 = 16 \quad \min = 2^3 = 8$$



159. Find max&min value of $9\sin^2 \theta \cdot 27\cos^2 \theta$.

$9\sin^2 \theta \cdot 27\cos^2 \theta$ का अधिकतम और न्यूनतम मान ज्ञात कीजिए।

(a) 27, 9

(b) 1, -1

(c) 18, 9

(d) 9, -27

$$\left(\frac{2}{3}\right)^{\sin^2 \theta} \cdot \left(\frac{3}{3}\right)^{\cos^2 \theta}$$

$$\frac{2\sin^2 \theta + 3\cos^2 \theta}{3}$$

$$\text{max} = \frac{3}{3} = 1 \quad \text{min} = \frac{2}{3} = \frac{2}{3}$$

$$\# \quad \underbrace{4 \sin^2 \theta + 3 \cos^2 \theta}_{\text{max}}$$

$$4 \times 1 + 3 \times 1$$

$$4 + 3$$

$$= 7$$

min.

$$4 \times 0 + 3 \times 0$$

$$0 + 0$$

$$= 0$$

$$\sin^{(\text{even})} \theta + \cos^{(\text{even})} \theta$$

$$\underline{\underline{\text{max} = 1}}$$

$$\text{min.} = \underline{\underline{\theta = 45^\circ}}$$

$$\underline{\underline{\text{ex}}} \sin^2 \theta + \cos^2 \theta$$

$$\left(\frac{1}{\sqrt{2}}\right)^2 + \left(\frac{1}{\sqrt{2}}\right)^2$$

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

$$\sin^4 \theta + \cos^6 \theta$$

$$\underline{\underline{\text{max}=1}} \quad |$$

$$\theta = 45^\circ \Rightarrow \underline{\underline{\text{min.}}}$$

$$\left(\frac{1}{\sqrt{2}}\right)^4 + \left(\frac{1}{\sqrt{2}}\right)^6$$

$$\left(\frac{1}{2}\right)^2 + \left(\frac{1}{2}\right)^3$$

$$\frac{1}{4} + \frac{1}{8}$$

$$\frac{2+1}{8} = \frac{3}{8}$$

$$AM \geq GM$$

$$\boxed{a, b}$$

$$\frac{a+b}{2} \geq \sqrt{ab}$$

$$\boxed{a+b \geq 2\sqrt{ab}}$$

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

$$\text{min. value} = 2\sqrt{ab}$$

$$x \Rightarrow \sin \theta \Rightarrow a \sin^2 \theta + b \operatorname{cosec}^2 \theta \quad \boxed{a > b}$$

$$\text{min. value} = 2\sqrt{ab}$$

$$\text{If } \boxed{a < b} \quad \text{min. value} = (a+b)$$

$$x = \cos \theta \Rightarrow a \cos^2 \theta + b \sec^2 \theta \begin{cases} \text{if } a > b \Rightarrow \text{min} = 2\sqrt{ab} \\ \text{if } a < b \Rightarrow \text{min} = a+b \end{cases}$$

$$\underline{a \tan^2 \theta + b \cot^2 \theta}$$



$$\text{min.} = 2\sqrt{ab}$$



$$Y = a \tan^2 \theta + b \cot^2 \theta (a > 0, b > 0)$$

Min.

$$2\sqrt{ab}$$

Max.

$$\infty$$



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$$Y = a \sin^2 \theta + b \operatorname{cosec}^2 \theta (a > 0, b > 0)$$

$$Y = a \cos^2 \theta + \underline{b \sec^2 \theta} (a > 0, b > 0)$$

$$\text{Min}^m. \quad \underline{2\sqrt{a \cdot b}} \quad (a \geq b)$$

$$\text{Min}^m. \quad (a + b) \quad (\underline{a \leq b})$$

$$\text{Max}^m. \quad \infty$$



160. If $Y = 4 \tan^2 \theta + 9 \cot^2 \theta$ then find the value $Y_{\min}$
यदि $Y = 4 \tan^2 \theta + 9 \cot^2 \theta$ है, तो Y का न्यूनतम मान ज्ञात कीजिए?

$$\text{min.} = 2\sqrt{4 \times 9}$$

(a) 12

(b) 4

(c) 6

(d) 9

$$2\sqrt{36}$$

$$2 \times 6 = 12$$



161. If $Y = 8\tan^2 \theta + 2\cot^2 \theta$ then find the value of $Y_{\min}$ is:

यदि $Y = 8\tan^2 \theta + 2\cot^2 \theta$ है, तो Y का न्यूनतम मान ज्ञात कीजिए।

(a) 8

(b) 4

(c) 2

(d) 6

$$Y_{\min} = 2\sqrt{ab}$$

$$2\sqrt{8 \times 2}$$

$$2\sqrt{16}$$

$$2 \times 4 = 8$$



162. The least value of $8\operatorname{cosec}^2 \theta + 25\sin^2 \theta$ is
 $8\operatorname{cosec}^2 \theta + 25\sin^2 \theta$ का न्यूनतम मान क्या होगा?:

(a) $30\sqrt{2}$

(b) $40\sqrt{2}$

(c) $10\sqrt{2}$

(d) $20\sqrt{2}$

$\therefore \sin^2 \theta + 8 \operatorname{cosec}^2 \theta$

$\min = 2\sqrt{25 \times 8}$

$2\sqrt{200}$

$2 \times 10 \sqrt{2}$

$20\sqrt{2}$

$\checkmark$ If $a > b \Rightarrow 2\sqrt{ab}$
 if $a < b \Rightarrow a + b$

(SSC-CHSL Pre. 12/10/2020)



163. Find minimum value of $4\sec^2 \theta + 1\cos^2 \theta$.

$4\sec^2 \theta + 1\cos^2 \theta$ का न्यूनतम मान ज्ञात कीजिए।

(a) 12

(b) 4

(c) 9

(d) 5

$$1\cos^2 \theta + 4\sec^2 \theta$$

$$\underline{a < b} \quad \text{min.} = \underline{a + b}$$

$$\text{min. Value} = 1 + 4 = \textcircled{5}$$



$$Y = a \sec^2 \theta + b \operatorname{cosec}^2 \theta \quad (a > 0, b > 0)$$

Min.

$$(\sqrt{a} + \sqrt{b})^2$$

Max.

$$\infty$$

$$(\sqrt{a} + \sqrt{b})^2$$



164. Find minimum value of $4\sec^2 \theta + 25\operatorname{cosec}^2 \theta$.

$4\sec^2 \theta + 25\operatorname{cosec}^2 \theta$ का न्यूनतम मान ज्ञात कीजिए।

(a) 36

(b) 49

(c) 25

(d) 16

$$4(1 + \tan^2 \theta) + 25(1 + \cot^2 \theta)$$

$$4 + 4\tan^2 \theta + 25 + 25\cot^2 \theta$$

$$29 + \underbrace{4\tan^2 \theta + 25\cot^2 \theta}$$

$$2\sqrt{4 \times 25}$$

$$2\sqrt{100} = 2 \times 10 = 20$$

$$\begin{array}{l} 29 + 20 \\ = 49 \end{array}$$



164. Find minimum value of $4\sec^2 \theta + 25\operatorname{cosec}^2 \theta$.

$4\sec^2 \theta + 25\operatorname{cosec}^2 \theta$ का न्यूनतम मान ज्ञात कीजिए।

(a) 36

(b) 49

(c) 25

(d) 16

$$\begin{aligned}\text{min. value} &= (\sqrt{4} + \sqrt{25})^2 \\ &= (2 + 5)^2 \\ &= 7^2 = 49\end{aligned}$$

$$\sin \theta \cdot \cos \theta$$

$$\frac{1}{2} \times 2 \sin \theta \cdot \cos \theta$$

$$\frac{1}{2} \sin 2\theta \quad \Rightarrow \quad \begin{array}{cc} \text{min} & \text{max} \\ -\frac{1}{2} & +\frac{1}{2} \end{array}$$

$$\sin^2 \theta \cdot \cos^2 \theta$$

$$\frac{1}{2^2} \times \underbrace{2^2 \sin^2 \theta \cdot \cos^2 \theta}$$

$$\frac{1}{4} \sin^2 2\theta$$

0 1

$$\text{min.} = \frac{1}{4} \times 0 = 0$$

$$\text{max} = \frac{1}{4} \times 1 = \frac{1}{4}$$

$$\sin^3 \theta \cdot \cos^3 \theta$$

$$\frac{1}{2^3} \times 2^3 \sin^3 \theta \cdot \cos^3 \theta$$

$$\frac{1}{8} (\sin^3 2\theta)$$


$$\text{min.} = -\frac{1}{8}$$

$$\text{max} = +\frac{1}{8}$$

$\sin^n \theta \cdot \cos^n \theta$ $n = \text{natural No.}$

max. Value



$$\frac{1}{2^n}$$

min. Value

$n = \text{even}$



$$0$$

$n = \text{odd}$



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



$$\begin{aligned} \min (\sin^n \theta \cdot \cos^n \theta) &= \left(\frac{-1}{2} \right)^n & (n \rightarrow \text{odd}) \\ &= 0 & (n \rightarrow \text{even}) \end{aligned}$$

$$\max \cdot (\sin^n \theta \cdot \cos^n \theta) = \left(\frac{1}{2} \right)^n$$



165. Find the minimum and maximum value of $2\sin \theta \cdot \cos \theta$.

$2\sin \theta \cdot \cos \theta$ का न्यूनतम और अधिकतम मान ज्ञात कीजिए।

(a) 0, 1

(b) $-\frac{1}{2}, \frac{1}{2}$

(c) -1, 1

(d) None of these

$$\begin{array}{c} \sin 2\theta \\ \swarrow \quad \searrow \\ -1 \quad \quad +1 \end{array}$$

166. Find the minimum and maximum value of $Y = 32 \sin^5 \theta \cdot \cos^5 \theta$.

$Y = 32 \sin^5 \theta \cdot \cos^5 \theta$ का न्यूनतम और अधिकतम मान ज्ञ कीजिए।

$$32 (\sin^5 \theta \cdot \cos^5 \theta)$$

(a) $-\frac{1}{32}, \frac{1}{32}$

(b) $-1, 1$

(c) $0, 1$

(d) None of these

max

$$\frac{1}{2^5} = \frac{1}{32}$$

$$32 \times \frac{1}{32}$$

①

min

$$-\frac{1}{2^5} = -\frac{1}{32}$$

$$32 \times \left(-\frac{1}{32}\right)$$

②



$$\max_{0 \leq \theta \leq 90} (\sin^{2n} \theta + \cos^{2m} \theta) = 1 [m, n \geq 2]$$

167. If $A = \sin^2 \theta + \cos^4 \theta$, for any value of θ , then the value of A is :

यदि θ के किसी मान के लिए $A = \sin^2 \theta + \cos^4 \theta$ है, तो A का मान है।

(a) $1 \leq A \leq 2$

(b) $\frac{3}{4} \leq A \leq 1$

(c) $\frac{13}{16} \leq A \leq 1$

(d) $\frac{3}{4} \leq -A \leq \frac{13}{16}$

$\sin^{\text{even}} \theta + \cos^{\text{even}} \theta$

$\max = 1$

$\min = 0 = 45^\circ$

$A \leq 1$

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

$\frac{1}{2} + \frac{1}{4} = \frac{3}{4}$

168. The maximum value of $1 + \sin \left(\frac{x}{4} + \theta \right) + 2\cos \left(\frac{x}{4} - \theta \right)$ for real values of θ is :

θ के वास्तविक मान के लिए $1 + \sin \left(\frac{x}{4} + \theta \right) + 2\cos \left(\frac{x}{4} - \theta \right)$ का अधिकतम मान क्या होगा?

(a) 3

(b) 4

(c) 5

(d) 6

$$1 + 1 + 2 \times 1$$

$$= 4$$

$$\frac{x}{4} + \theta = 90^\circ$$

$$\frac{x}{4} - \theta = 0^\circ \Rightarrow \frac{x}{4} = \theta$$

$$\theta + \theta = 90$$

$$2\theta = 90$$

Q

$$\underbrace{4\sin^2\theta + 3\cos^2\theta} + \underbrace{6\sin^2\alpha + 7\cos^2\alpha} + \underbrace{8\cos^2\beta}_{0!}$$

max value = ?

$$4 + 7 + 8 \\ \Rightarrow 19$$

min. value

$$3 + 6 + 8 \times 0$$

$$9 + 0$$

$$= 9$$

$$\sin^2\theta + \cos^2\theta + \tan^2\theta + \cot^2\theta + \sec^2\theta + \operatorname{cosec}^2\theta$$

$$1 + \tan^2\theta + \cot^2\theta + 1 + \tan^2\theta + 1 + \cot^2\theta$$

$$3 + 2(\tan^2\theta + \cot^2\theta)$$

$2\sqrt{1 \times 1}$
 $= 2$

$$3 + 2 \times 2$$

$$= 3 + 4 = \textcircled{7}$$



170. If $a \sin^3 X + b \cos^3 X = \sin X \cos X$ and $a \sin X = b \cos X$, then find the value of $a^2 + b^2$, provided that x is neither 0° nor 90° .

यदि $a \sin^3 X + b \cos^3 X = \sin X \cos X$ और $a \sin X = b \cos X$ हो, तो $a^2 + b^2$ का मान ज्ञात कीजिए, बशर्ते कि x न तो 0° है और न ही 90° है।

$$a \sin x = b \cos x$$

(a) 0

(b) 1

(c) $a^2 - b^2$

(d) $a^2 + b^2$

$$a \sin x \cdot \sin^2 x + b \cos^3 x = \sin x \cdot \cos x$$

$$b \cos x \cdot \sin^2 x + b \cos^3 x = "$$

$$b \cos x (\sin^2 x + \cos^2 x) = \sin x \cdot \cos x$$

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$$b \cancel{\cos x} = \sin x \cdot \cancel{\cos x}$$

$$b = \sin x$$

$$a \cancel{x} = \cancel{b} \cos x$$

$$a = \cos x$$

Putting the
value of $\sin \alpha$ &
 $\cos \alpha$ in original
eqn.

$$a \times (b)^3 + b \times a^3 = a \times b$$

$$\cancel{a}b(a^2 + b^2) = \cancel{a}\cancel{b}$$

$$a^2 + b^2 = 1$$

$$\underline{\underline{\hspace{1.5cm}}}$$



4.w

171. If $m = a \sec A$ and $y = b \tan A$, then find the value of $b^2 m^2 - a^2 y^2 + \frac{a^2 y^2}{b^2 m^2} + \cos^2 A$.

यदि $m = a \sec A$ और $y = b \tan A$ है, तो $b^2 m^2 - a^2 y^2 + \frac{a^2 y^2}{b^2 m^2} + \cos^2 A$ का मान ज्ञात कीजिए।

(a) $a^2 b^2$

(b) $1 - a^2 b^2$

(c) $a^2 b^2 + 2$

(d) $a^2 b^2 + 1$

$$m^2 = a^2 \sec^2 A$$

$$y^2 = b^2 \tan^2 A$$

$$\frac{m^2}{a^2} = \sec^2 A \Rightarrow \frac{a^2}{m^2} = \cos^2 A$$

$$\frac{y^2}{b^2} = \tan^2 A$$

$$b^2 \times a^2 \sec^2 A - a^2 \times b^2 \tan^2 A + \cos^2 A \times \tan^2 A + \cos^2 A$$

$$b^2 a^2 (\sec^2 A - \tan^2 A) + \underbrace{\sin^2 A + \cos^2 A}_1$$

$$\underline{\underline{b^2 a^2 + 1}}$$