MATHS

BOOKS - KC SINHA ENGLISH

TRIGONOMETRIC RATIO AND IDENTITIES - FOR COMPETITION

Solved Examples

1. If $\pi < x < 2\pi$, prove that

$$\frac{\sqrt{1+\cos x}+\sqrt{1-\cos x}}{\sqrt{1+\cos x}-\sqrt{1-\cos x}}=\cot\left(\frac{\pi}{2}+\frac{\pi}{4}\right)$$

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2. If $\sin(A-B)=\frac{1}{\sqrt{10}}$, $\cos(A+B)=\frac{2}{\sqrt{29}}$, find the value of $\tan 2A$ where A and B lie between 0 and $\frac{\pi}{4}$

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3. Suppose $\sin^3 x \sin 3x = \sum_{m=0}^{n} C_m \cos mx$ is an identity in x, where C_0, C_1, C_n are constants and $C_n \neq 0,$ the the value of n is _______

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4. Find the sum : $\tan x . \tan 2x + \tan 2x \tan 3x + ... + \tan nx . \tan(n+1)x$

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5. Find the sum of series $\cos ec\theta + \cos ec 2\theta + \cos ec 4\theta + ...$ to n terms .

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6. Prove that: $s \in^4 \frac{\pi}{8} + s \in^4 \frac{3\pi}{8} + s \in^4 \frac{5\pi}{8} + s \in^4 \frac{7\pi}{8} = \frac{3}{2}$

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7. Prove that $\sin\theta + \sin 3\theta + \sin 5\theta + \ldots\ldots. + \sin(2\pi - 1)\theta = \frac{\sin^2 \pi\theta}{\sin\theta}$

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8. Prove that

$$\sum_{k=1}^{n-1} (n-k)\frac{\cos(2k\pi)}{n} = -\frac{n}{2}, wheren \geq 3isan \in te \geq r$$

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9. If $p = \sum_{p=1}^{32} (3p+2)\left(\sum_{q=1}^{10}\left(\sin\frac{2q\pi}{11} - i\cos\frac{2q\pi}{11}\right)\right)^p$, where $i = \sqrt{-1}$

and if (1+i)P=n(n!),n $\in$ N, then the value of n is

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10. If $\theta = \dfrac{\pi}{2^n + 1}$, prove that: $2^n \cos\theta \cos 2\theta \cos 2^2 \cos 2^{n-1}\theta = 1$.

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11. Find the value of $\dfrac{\cos(2\pi)}{7} + \dfrac{\cos(4\pi)}{7} + \dfrac{\cos(6\pi)}{7}$

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12. Prove that:

$$s \in \frac{\pi}{14} s \in \frac{3\pi}{14} s \in \frac{5\pi}{14} s \in \frac{7\pi}{14} s \in \frac{9\pi}{14} s \in \frac{11\pi}{14} s \in \frac{13\pi}{14} = \frac{1}{64}$$

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13. If $A = \sin\left(\frac{2\pi}{7}\right) + \sin\left(\frac{4\pi}{7}\right) + \sin\left(\frac{8\pi}{7}\right)$ and $B = \cos\left(\frac{2\pi}{7}\right) + \cos\left(\frac{4\pi}{7}\right) + \cos\left(\frac{8\pi}{7}\right)$ then $\sqrt{A^2 + B^2}$ is equal to

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14. $\tan^2{}'\frac{\pi}{16}+\tan^2{}'\frac{2\pi}{16}+\tan^2{}'\frac{3\pi}{16}+\tan^2{}'\frac{5\pi}{16}+\tan^2{}'\frac{6\pi}{16}+\tan^2{}'\frac{7x}{16}$ is equal to

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15. Prove that : $\tan\frac{\pi}{7}\cdot\tan\frac{2\pi}{7}\cdot\tan\frac{3\pi}{7}=\sqrt{7}$

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16. Show that: $\left(\tan^2\frac{\pi}{7}+\tan^2\frac{2\pi}{7}+\tan^2\frac{3\pi}{7}\right)\left(\cot^2\frac{\pi}{7}+\cot^2\frac{2\pi}{7}+\cot^2\frac{3\pi}{7}\right)=105$

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17. Prove that: $tan\alpha+2\tan 2\alpha+4\tan 4\alpha+8\cot 8\alpha=\cot\alpha$

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18. Prove that: $\frac{\sin x}{\cos 3x}+\frac{\sin 3x}{\cos 9x}+\frac{\sin 9x}{\cos 27x}=(\tan 27x-\tan x)$

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19. $\cot 16^0 \cot 44^0+\cot 44^0 \cot 76^0-\cot 76^0 \cot 16^0=$ 1 (b) 2 (c) 3 (d) 4

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20. Show that: If $\theta=\frac{2\pi}{7}$, prove that $\tan\theta\tan 2\theta+\tan 2\theta\tan 4\theta+\tan 4\theta\tan\theta=-7$

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21. If $\frac{\sin^4\theta}{a}+\frac{\cos^4\theta}{b}=\frac{1}{a+b}$, prove that $\frac{\sin^8\theta}{a^3}+\frac{\cos^4\theta}{b^3}=\frac{1}{(a+b)^3}\ \frac{\sin^{4n}\theta}{a^{2n-1}}+\frac{\cos^{4n}\theta}{b^{2n-1}}=\frac{1}{(a+b)^{2n-1}}, n\in N$

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22. If $A+B+C=\pi,$ express $S=\sin 3A+\sin 3B+\sin 3C$ as a product of three trigonometric ratios. If $S=0,$ Show that at least one of the angles is 60°.

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23. The value of

$\sin x \sin y \sin(x-y)+\sin y \sin z \sin(y-z)$

$+\sin z \sin x \sin(z-x)+\sin(x-y)\sin(y-z)\sin(z-x),$ is

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24. If $a \leq 3\cos x+5\sin\left(x-\frac{\pi}{6}\right) \leq b$ for all x then (a, b) is $\left(-\sqrt{19}, \sqrt{19}\right)$ (b) $(-17, 17)$ $\left(-\sqrt{21}, \sqrt{21}\right)$ (b) $none of these$

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25. Prove that $(2\sqrt{3}+3)\sin\theta+2\sqrt{3}\cos\theta$ lies between $(2\sqrt{3}+\sqrt{15} and (2\sqrt{3}+\sqrt{15})$.

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26. Prove that $\frac{\tan x}{\tan 3x}$ never lies between $\frac{1}{3}$ and 3.

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27. Show that the expression $\frac{\tan(x+\alpha)}{\tan(x-\alpha)}$ cannot lie between the values $\tan^2\left(\frac{\pi}{4}-\alpha\right)$ and $\tan^2\left(\frac{\pi}{4}+\alpha\right)$

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28. Show that the expression $\cos\theta\left(\sin\theta+\sqrt{\sin^2\theta+\sin^2\alpha}\right)$ always lies between the values of $\pm\sqrt{1+\sin^2\alpha}$

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29. If $f(x) = \sin^6 x + \cos^6 x$ and M_1 and M_2, be the maximum and minimum values of $f(x)$ for all values ofx then $M_1 - M_2$ is equal to

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30. If $8\theta = \pi$ show that $\cot 7\theta + \cot \theta = 0$

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31. If $\tan \theta = 3 \tan \phi$, then the maximum value of $\tan^2(\theta - \phi)$ is (where, $\tan \phi > 0$)

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32. Prove that the inequality $|\sin nx| \leq n|\sin x|$ is valid for all positive integers n

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33. Show that $2^{\sin x} + 2^{\cos x} \geq 2^{1 - \frac{1}{\sqrt{2}}}$ for all real x.

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34. If angle C of a triangle ABC be obtuse, then (A) $0 < \tan A \tan B < 1$ (B) $\tan A \tan B > 1$ (C) $\tan A \tan B = 1$ (D) none of these

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35. If $\frac{1}{\cos\alpha \cdot \cos\beta} + \tan\alpha \cdot \tan\beta = \tan\gamma$, where $0 < \gamma < \frac{\pi}{2}$ and α, β are positive acute angles, show that $\frac{\pi}{4} < \gamma < \frac{\pi}{2}$

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36. If $\cos(\theta+\phi)\cos\theta$ and $\cos(\theta+\phi)$ are in harmonic progression then $\cos\theta\sec\frac{\phi}{2}$ is :

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37. Prove that:

$$\frac{2\cos 2^n\theta+1}{2\cos\theta+1}=(2\cos\theta-1)(2\cos 2\theta-1)\left(2\cos 2^2\theta-1\right)\ldots\left(2\cos 2^{n-1}\theta-1\right.$$

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38. If $\theta=240^\circ$ is the following statement correct? $2\sin\frac{\theta}{2}=\sqrt{1+\sin\theta}-\sqrt{1-\sin\theta}$

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39. If $0<\theta,\phi<\pi$ and $\cos\phi+\cos\theta-\cos(\theta+\phi)=\frac{3}{2}$ prove that $\theta=\phi=\frac{\pi}{3}$.

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40. let $\cos\left(\frac{\pi}{7}\right), \cos\left(\frac{3\pi}{7}\right), \cos\left(\frac{5\pi}{7}\right)$, the roots of equation $8x^3 - 4x^2 - 4x + 1 = 0$ then the value of $\sin\left(\frac{\pi}{14}\right), \sin\left(\frac{3\pi}{14}\right), \sin\left(\frac{5\pi}{14}\right)$

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41. The product of the sines of the angles of a triangle is p and the product of their cosines is q. Show that the tangents of the angles are the roots of the equation $qx^3 - px^2 + (1+q)x - p = 0$.

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42. If exp $\left[\left(\sin^2 x + \sin^4 x + \sin^6 x + \dots \infty\right) \text{ In}2\right]$ satisfies the equation $y^2 - 9y + 8 = 0$, then the value of $\frac{\cos x}{\cos x + \sin x}, 0 < x < \frac{\pi}{2}$, is

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43. Prove that the function: $f(x) = \cos^2 x + \cos^2\left(\frac{\pi}{3} + x\right) - \cos x \cdot \cos\left(\frac{\pi}{3} + x\right)$ is constant function. Find the value of that constant

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44. For `0sin(cosx)`

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45. If $tan\alpha = \frac{p}{q}$, where $\alpha = 6\beta, \alpha$ being acute angle, prove that $\frac{1}{2}\{p\cos ec2\beta = q\sec 2\beta\} = \sqrt{p^2 + q^2}$

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46. if $\cos^2\theta = \frac{m^2 - 1}{3}$ and $\tan^3\frac{\theta}{2} = \tan\alpha,$ prove that $\cos^{2/3}\alpha + \sin^{2/3}\alpha = \left(\frac{2}{m}\right)^{2/3}$

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47. Let $ABCD$ be a quadrilateral with area 18 , side AB parallel to the side $CD, andAB = 2CD$. Let AD be perpendicular to $ABandCD$. If a circle is drawn inside the quadrilateral $ABCD$ touching all the sides, then its radius is $a = 3$ (b) 2 (c) $\frac{3}{2}$ (d) 1

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48. about to only mathematics

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49. Which of the following number(s) is/are rational? $\sin 15^0$ (b) $\cos 15^0$ $\sin 15^0 \cos 15^0$ (d) $\sin 15^0 \cos 75^0$

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50. $\tan 5^\circ$ is (A) rational number (B) Irrational number (C) prime number (D) none of these

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51. If $\frac{2\sin\alpha}{1+\cos\alpha+\sin\alpha}=y$, then prove that $\frac{1-\cos\alpha+\sin\alpha}{1+\sin\alpha}$ is also equal to y.

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52. If $\alpha+\beta=\frac{\pi}{2}$ and $\beta+\gamma=\alpha$, then $\tan\alpha$ equals

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53. The maximum value of $(\cos\alpha_1).(\cos\alpha_2)..........(\cos\alpha_n)$, under the restrictions

$0 \le \alpha_1, \alpha_2.........., \alpha_n \le \frac{\pi}{2}$ and $(\cot\alpha_1)(\cot\alpha_2).........(\cot a_n) = 1$ is

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54. If $\frac{\sin^4 x}{2} + \frac{\cos^4 x}{3} = \frac{1}{5} then$ $\tan^2 x = \frac{2}{3}$ (b) $\frac{\sin^8 x}{8} + \frac{\cos^8 x}{27} = \frac{1}{125}$ $\tan^2 x = \frac{1}{3}$ (d) $\frac{\sin^8 x}{8} + \frac{\cos^8 x}{27} = \frac{2}{125}$

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55. For a positive integer n, let $f_n(\theta) = (\tan\theta/2)(1+\sec\theta)(1+\sec 2\theta)(1+\sec 4\theta)..........(1+\sec 2^n\theta)$. Then (a) $f_2\left(\frac{\pi}{16}\right) = 1$ (b) $f_3\left(\frac{\pi}{32}\right) = 1$ (c) $f_4\left(\frac{\pi}{64}\right) = 1$ (d) $f_5\left(\frac{\pi}{128}\right) = 1$

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56. If $T_n = \sin^n \theta + \cos^n \theta$, then $\dfrac{T_6 - T_4}{T_6} = m$ holds for values of m satisfying (A) $m \in \left[-1, \dfrac{1}{3}\right]$ (B) $m \in \left[0, \dfrac{1}{3}\right]$ (C) $m \in [-1, 0]$ (D) $m \in \left[-1, -\dfrac{1}{2}\right]$

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57. If $\cot \theta + \tan \theta = x$ and $\sec \theta - \cos \theta = y$, then show that $\sin \theta \cdot \cos \theta = \dfrac{1}{x}$ or $\sin \theta \cdot \cos \theta = \dfrac{1}{x}$ or $\sin \theta \cdot \tan \theta = y$ or $(x^2 y)^{2/3} - (xy^2)^{2/3} - (xy^2)^{2/3} = 1.$

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58. Which of the following has the maximum value unity: (a) $\sin^2 x - \cos^2 x$ (b)$\dfrac{\sin 2x - \cos 2x}{\sqrt{2}}$ (c)$-\dfrac{\sin 2x - \cos 2x}{\sqrt{2}}$ (d) $\left(\sqrt{\dfrac{6}{5}}\right)\left(\dfrac{1}{\sqrt{2}}\sin x + \sqrt{3}\cos x\right)$

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59. Statement I The triangle so obtained is an equilateral triangle.

Statement II If roots of the equations be $\tan A$, $\tan B$ and $\tan C$ then $\tan A + \tan B + \tan C = 3\sqrt{3}$

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60. If A,B,C are the angles of a given triangle ABC . If cosA.cosB.cosC= $\frac{\sqrt{3}-1}{8}$ and sinA.sinB.sinC=$\frac{3+\sqrt{3}}{8}$ The cubic equation whose roots are $\tan A, \tan B, \tan C$ is (A)

$x^3 - (3+2\sqrt{3})x^2 + (5+4\sqrt{3})x - (3+2\sqrt{3}) = 0$ (B)

$x^3 - (3 \pm 2\sqrt{3})x^2 + (5+4\sqrt{3})x + (3+2\sqrt{3}) = 0$ (C)

$x^3 + (3+2\sqrt{3})x^2 + (5+4\sqrt{3})x + (3+2\sqrt{3}) = 0$ (D)

$x^3 - (3+2\sqrt{3})x^2 + (5+4\sqrt{3})x + (3+2\sqrt{3}) = 0$

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61. The maximum value of the expression

$\frac{1}{\sin^2\theta + 3\sin\theta\cos\theta + 5\cos^2\theta}$ is ________.

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62. If $K=\sin\left(\frac{\pi}{18}\right)\sin\left(\frac{5\pi}{18}\right)\sin\left(\frac{7\pi}{18}\right)$, then the numerical value of K is_____

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63. If $A>0, B>0 and A+B=\frac{\pi}{3}$, the maximum value of $\tan A \tan B$ is______

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64. If $\cos\theta=\frac{a}{b+c}, \cos\phi=\frac{b}{a+c}, \cos\psi=\frac{c}{a+b}$, where $theat, \phi, \psi \in (0,\pi)$ and a,b , c are sides of triangle ABC then find the value of $\tan^2\frac{\theta}{2}+\tan^2\frac{\phi}{2}+\tan^2\frac{\psi}{2}$,

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Exercise

1. If $0 < x < \frac{\pi}{2}$ prove that $\sqrt{\tan x + \sin x} + \sqrt{\tan x - \sin x} = 2\sqrt{\tan x}\cos\left(\frac{\pi}{4} - \frac{x}{2}\right)$

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2. If $\sin^3 x \sin 3x = \sum_{n=0}^{6} c_n \cos^n x$ where $c_0, c_1, c_2, \ldots c_6$ are constants. then find the value of c_4

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3. $\cos\theta + \cos 2\theta + \cos 3\theta + \ldots\ldots. + \cos(n-1)\theta + \cos n\theta =$

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4. Prove that $\sin^2\theta+\sin^2 2\theta+\sin^2 3\theta+\ldots.+\sin^2 n\theta=\frac{n}{2}-\frac{\sin n\theta\cos(n+1)\theta}{2\sin\theta}$

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5. Find the value of $\sin 5^\circ+\sin 77^\circ+\sin 149^\circ+\ldots+\sin 293^\circ$

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6. Show that: $\cos\frac{\pi}{n}+\cos\frac{2\pi}{n}+\ldots+\cos\frac{n-1}{n}\pi=0$

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7. Prove that $\cos\left(\frac{2\pi}{7}\right)+\cos\left(\frac{4\pi}{7}\right)+\cos\left(\frac{6\pi}{7}\right)=-\frac{1}{2}$

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8. The expression $3\left[\sin^4\left(\frac{3}{2}\pi-\alpha\right)+\sin^4(3\pi+\alpha)\right]-2\left[\sin^6\left(\frac{1}{2}\pi+\alpha\right)+\sin^6(5\pi-\alpha)\right]$ is equal to

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9. $\sin 36^{\circ}\sin 72^{\circ}+108^{\circ}\sin 144^{\circ}=$

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10. The value of $\sin^2 12^\circ+\sin^2 21^\circ 3^\circ+\sin^2 48^\circ-\sin^2 9^\circ-\sin^2 18^\circ$ is

____

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11. Prove that: $\tan 142\frac{1^0}{2}=2+\sqrt{2}-\sqrt{3}-\sqrt{6}$

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12. If $0 < \alpha < \frac{\pi}{6}$ and $\sin\alpha + \cos\alpha = \frac{\sqrt{7}}{2}$, then $\frac{\tan\alpha}{2}$ is equal to

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13. If alpha + beta + gamma = π/2 and cot alpha, cot beta, cot gamma are in Ap. Then cot alpha. Cot gamma

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14. Prove that $\cos\left(\frac{2\pi}{15}\right)\cos\left(\frac{4\pi}{15}\right)\cos\left(\frac{8\pi}{15}\right)\cos\left(\frac{16\pi}{15}\right) = \frac{1}{16}$

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15. It $\cos(\alpha+\beta) = \frac{4}{5}, \sin(\alpha-\beta) = \frac{5}{13} and \alpha, \beta$ lie between $0 and \frac{\pi}{4}$, prove that $\tan 2\alpha = \frac{56}{33}$

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16. Sum the series

$\tan\alpha\tan(\alpha+\beta)+\tan(\alpha+\beta)+\tan(\alpha+2\beta)+\tan(\alpha+2\beta)\tan(\alpha+3\beta)$

to n terms`

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17. prove that $\cot\theta.\cot 2\theta+\cot 2\theta.\cot 3\theta+2=\cot\theta(\cot\theta-\cot 3\theta)$

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18. Show that $\frac{1+\sin A}{\cos A}+\frac{\cos B}{1-\sin B}=\frac{2\sin A-2\sin B}{\sin(A-B)+\cos A-\cos B}$

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19. If $\frac{\cos^4 A}{\cos^2 B}+\frac{\sin^4 A}{\sin^2 B}=1$ then prove that $\frac{\cos^4 B}{\cos^2 A}+\frac{\sin^4 B}{\sin^2 A}=1$

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20. If $\theta + \phi + \psi = 2\pi,$ prove that $\cos^2\theta + \cos^2\phi + \cos^2\psi - 2\cos\theta\cos\phi\cos\psi = 1$

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21. Find cos 1395°

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22. Show that: $\sin A \sin(B - C) + \sin B \sin(C - A) + \sin C \sin(A - B) = 0$

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23. If $u_n = \sin^{\text{n}}\theta + \cos^n\theta,$ then prove that $\dfrac{u_5 - u_7}{u_3 - u_5} = \dfrac{u_3}{u_1}$.

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24. If $x + y + z = xyz$, prove that:

a) $\frac{3x - x^3}{1 - 3x^2} + \frac{3y - y^3}{1 - 3y^2} + \frac{3z - z^3}{1 - 3z^2} = \frac{3x - x^3}{1 - 3x^2} \cdot \frac{3y - y^3}{1 - 3y^2} \cdot \frac{3z - z^3}{1 - 3z^2}$

b) $\frac{x + y}{1 - xy} + \frac{y + z}{1 - yz} + \frac{z + x}{1 - zx} = \frac{x + y}{1 - xy} \cdot \frac{y + z}{1 - yz} \cdot \frac{z + x}{1 - zx}$

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25. Prove that $5 \cos \theta + 3 \cos\left(\theta + \frac{\pi}{3}\right) + 3$ lies between -4 and 10.

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26. What is the minimum value of $\left(\sin^2 \theta + \cos^4 \theta\right)$?

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27. Show that the minimum value of $\sin^8 x + \cos^8 x$ is $\frac{1}{8}$.

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28. If $0 < \alpha < \frac{\pi}{2}$ then show that $\tan\alpha + \cot\alpha > \sin\alpha + \cos\alpha$

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29. about to only mathematics

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30. Show that :$3\left(\tan^2\theta + \cot^2\theta\right) - 7(\cot\theta + \tan\theta) + 10 > 0$

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31. If $\alpha, \beta, \gamma, \in \left(0, \frac{\pi}{2}\right)$, then prove that $\frac{si(\alpha+\beta+\gamma)}{\sin\alpha + \sin\beta + \sin\gamma} < 1$

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32. If $0 < \theta < \pi, 0 < \phi < \pi$ and $\cos\phi + \cos\theta - \cos(\theta + \phi) = \frac{3}{2}$

prove that theta=phi= pi/3`

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33. If $\tan\alpha, \tan\beta$ are th roots of the eqution $x^2 + px + q = 0(p \neq 0)$

Then $\sin^2(\alpha + \beta) + p\sin(\alpha + \beta)\cos(\alpha + \beta) + q\cos^2(\alpha + \beta) =$

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34. If $\cos(\theta - \alpha) = a$ and $\sin(\theta - \beta) = b(0 < \theta - \alpha, \theta - \beta < \pi/2)$,

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

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35. If $\tan x \tan y = a$ and $x + y = 2b$ show that $\tan x$ and $\tan y$ are the

roots of the equation $z^2 - (1 - a)\tan 2b \cdot z + a = 0$

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37. If $\sin(y+z-x), \sin(z+x-y), \sin(x+y-z)$ are in A.P., then $tanx, \tan y, \tan z$ are in A.P. (b) G.P. (c) H.P. (d) none of these

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38. If $\alpha+\beta+\gamma=\pi$ and

$\tan.\frac{1}{4}(\beta+\gamma-\alpha)\tan.\frac{1}{4}(\gamma+\alpha-\beta)\tan.\frac{1}{4}(\alpha+\beta-\gamma)=1,$

then prove that $1+\cos\alpha+\cos\beta+\cos\gamma=0.$

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39. If $\left(x^2 - x\cos(A+B) + 1\right)$ is a factor of the expression, $2x^4 + 4x^3 \sin A \sin B - x^2(\cos 2A + \cos 2B) + 4x \cos A \cos B - 2$, then the other $ax^2 + bx + c$. Find the value of $(a+b+c)$ given $A = \frac{3\pi}{8}$ and $B = \frac{\pi}{24}$

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40. If $m \sin(\alpha + \beta) = \cos(\alpha - \beta)$, prove that
$$\frac{1}{1 - m \sin 2\alpha} + \frac{1}{1 - m \sin 2\beta} = \frac{2}{1 - m^2}.$$

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42. If $X = x\cos\theta - y\sin\theta, Y = x\sin\theta + y\cos\theta$ and $X^2 + 4XY + Y^2 = Ax^2$

, then :

(where A and B are constants)

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43. If a,b,c and k are constant quantities and α, β, γ are variable subjects to the relation

$a\tan\alpha + b\tan\beta + c\tan\gamma = k,$ then find the minimum value of $\tan^2\alpha + \tan^2\beta + \tan^2\gamma.$

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44. If A, B, C and D are angles of quadrilateral and $\frac{\sin(A)}{2}\frac{\sin(B)}{2}\frac{\sin(C)}{2}\frac{\sin(D)}{2} = \frac{1}{16},$ prove that $A = B = C = D = \frac{\pi}{2}$

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45. $\prod_{i=1}^{89} \tan i^{\circ} =$

(a) 0

(b) 1

(c) ∞

(d) none of these

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46. $\prod_{k=0}^{3} \left(1 + \cos \frac{(2k+1)\pi}{8}\right) =$

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47. If in a $ABC, \cos^2 A + \cos^2 B + \cos^2 C = 1,$ prove that the triangle is right angled.

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48. The value of $\prod_{k=0}^{6} \sin \frac{(2k+1)\pi}{14} =$

(A) $\frac{1}{16}$

(B) $\frac{1}{64}$

(C) $\frac{1}{32}$

(D) none of these

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49. Statement I If $A > 0, B > 0$ and $A + B = \frac{\pi}{3}$, then the maximum value of tan A tan B is $\frac{1}{3}$.

Statement II If $a_1 + a_2 + a_3 + \dots + a_n = k$(constant), then the value $a_1 a_2 a_3 \dots a_n$ is greatest when

$a_1 = a_2 = a_3 = \dots + a_n$

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50. Givent that $\frac{\pi}{2} < \alpha < \pi$ then the expression $\sqrt{\frac{1-\sin\alpha}{1+\sin\alpha}} + \sqrt{\frac{1+\sin\alpha}{1-\sin\alpha}}$ (A) $\frac{1}{\cos\alpha}$ (B) $-\frac{2}{\cos\alpha}$ (C) $\frac{2}{\cos\alpha}$ (D) does not exist

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51. If $A = \cos^2\theta + s \in^4 \theta,$ prove that $\frac{3}{4} \leq 1$ for all values of θ.

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52. Prove that $5\cos\theta + 3\cos\left(\theta + \frac{\pi}{3}\right) + 3$ lies between -4 and 10.

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53. $\cos\left(\frac{\pi}{7}\right)\cos\left(\frac{3\pi}{7}\right)\cos\left(\frac{5\pi}{7}\right)$ is (A) $\frac{1}{8}$ (B) $-\frac{1}{8}$ (C) $\frac{1}{2\sqrt{2}}$ (D) $\frac{1}{2}$

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54. If $\cos ecA + \cot A = \frac{5}{2}$, then $\tan A$ is

A. (A) $\frac{4}{9}$

B. (B) $\frac{3}{5}$

C. (C) $\frac{15}{16}$

D. (D) $\frac{20}{21}$

Answer: null

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55. If $x = \cos 10^\circ \cos 20^\circ \cos 40^\circ$, then the value of x is

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56. If $a\cos^2 3\alpha + b\cos^4\alpha = 16\cos^6\alpha + 9\cos^2\alpha$ is an identity, then

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57. If $\tan A = \frac{a}{a+1}$ and $\tan B = \frac{1}{2a+1}$ then the value of $A + B$ is:

(a).0 (b). $\frac{\pi}{2}$ (c). $\frac{\pi}{3}$ (d). $\frac{\pi}{4}$

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58. If $\sin x + \sin^2 x + \sin^3 x = 1$, then prove that $\cos^6 x - 4\cos^4 x + 8\cos^2 x - 4 = 0$.

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59. If $P_n = \cos^n \theta + \sin^n \theta$ then $2P_6 - 3P_4 + 1$ =

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60. if $2\sec 2\alpha = \tan\beta + \cot\beta$ then one of the value of $\alpha + \beta$ is (A) pi (B) $n\pi - \frac{\pi}{4}, n \in \mathbb{Z}$ (C) $\frac{\pi}{4}$ (D) $\frac{\pi}{2}$

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61. $\sin 163^0 \cos 347^0 + \sin 73^0 \sin 167^0 =$ a.$1/2$ b. 1 c. 0 d. none of these

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62. If $\sin 2\theta + \sin 2\phi = 1/2$ and $\cos 2\theta + \cos 2\phi = 3/2$, then $\cos^2(\theta - \phi) =$

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63. If $\lim_{x \to 2} \frac{2x^2 - 4f(x)}{x - 2} = m$, where $f(2) = 2, f'(2) = 1$, then $\cos ec 10^\circ - \sqrt{3} \sec 10^\circ$ is (A) 3m (B) 2m (C) m (D) none of these

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64. In a triangle PQR, $\angle R = \frac{\pi}{2}$.If $\tan\left(\frac{P}{2}\right)$&$\tan\left(\frac{Q}{2}\right)$, are the roots of the equation $ax^2 + bx + c = (a \neq 0)$ then

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65. $\tan 100^0 + \tan 125^0 + \tan 100^0 \tan 125^0$ is equal to 0 (b) $\frac{1}{2}$ (c) -1 (d) 1

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66. The equation $a \sin x + b \cos x = c$, where $|c| > \sqrt{a^2 + b^2}$ has (A) a unique solution (B) infinite number of solutions (C) no solution (D) none of these

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67. Find the value of $\frac{\cos(2\pi)}{7} + \frac{\cos(4\pi)}{7} + \frac{\cos(6\pi)}{7}$

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68. Find the minimum and maximum value of both functiins: a) $(12\sin x - 9\sin^2 x)$ b)$(5\sin^2\theta + 4\cos^2\theta)$

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69. If $\tan\theta + \tan\left(\theta + \frac{\pi}{3}\right) + \tan\left(\theta - \frac{\pi}{3}\right) = K\tan 3\theta$, then K is equal to

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70. If cosA=3/4, then 32 sin (A/2) sin ((5A) /2)= ------------ (A) √11 (B) -√11 (C) 11 (D) -11

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71. If $\cos\alpha + \cos\beta = a, \sin\alpha + \sin\beta = b,$ then $\cos(\alpha + \beta)$ is equal to

(A) $\frac{2ab}{a^2 + b^2}$ (B) $\frac{a^2 + b^2}{a^2 - b^2}$ (C) $\frac{a^2 - b^2}{a^2 + b^2}$ (D) $\frac{b^2 - a^2}{b^2 + a^2}$

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72. If $\frac{\cos A}{3} = \frac{\cos B}{4} = \frac{1}{5} - \frac{\pi}{2} < A < 0 - \frac{\pi}{2} < b < 0$ then value of 2sinA +4 sin B is

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73. If $3\cos x + 2\cos 3x = \cos y, \ 3\sin x + 2\sin 3x = \sin y,$ then $\cos 2x$ equals

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74. The value of K in order that $f(x) = \sin x - \cos x - Kx + 5$ decreases for all positive real value of x is given by

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75. Range of $f(x) = \sin^{20} x + \cos^{48} x$ is (A) $[0, 1]$ (B) $(0, 1]$ (C) $(0, \infty)$ (D) none of these

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76. Range of $f(x) = \sin^6 x + \cos^6 x$ is :

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77. If $\sin x, \cos x, \tan x$ are in G.P., then $\cot^6 x - \cot^2 x =$ (A) 0 (B) -1 (C) 1 (D) depends on x

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78. Show that $2^{\sin x} + 2^{\cos x} \geq 2^{1 - \frac{1}{\sqrt{2}}}$ for all real x.

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79. If $\cos(x-y)$, $\cos x$ and $\cos(x+y)$ are in HP, then $\cos x \sec\left(\frac{y}{2}\right) =$

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80. If $3\cos\alpha = 2\cos(\alpha - 2\beta)$, then $\tan(\alpha-\beta)\tan\beta =$ (A) 5 (B) -5 (C) $\frac{1}{5}$ (D) $-\frac{1}{5}$

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81. If $\cos x = \tan y$, $\cos y = \tan z$, $\cos z = \tan x$, thenthe value $\sin x$ is

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82. Statement I In any triangle ABC

$a\cos A + b\cos B + c\cos C \leq s.$

Statement II In any triangle ABC

$\sin\left(\frac{A}{2}\right)\sin\left(\frac{B}{2}\right)\sin\left(\frac{C}{2}\right) \leq \frac{1}{8}$

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83. if $A + B + C = \pi$, prove that $\cos A + \cos B + \cos C$ greater than or equal to 1

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84. about to only mathematics

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85. Which of the following number(s) is/are rational? $\sin 15^0$ (b) $\cos 15^0$ $\sin 15^0 \cos 15^0$ (d) $\sin 15^0 \cos 75^0$

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86. Q. Let n be an add integer if $\sin n\theta = \sum_{r=0}^{n} (b_r)\sin^r \theta$, for every value of theta then, a. $b_0 = 1, b_1 = 3$ b. $b_0 = 0, b_1 = 1$ c. $b_0 = -1, b_1 = 1$ d. $b_0 = 0, b_1 = 2$

A. $b_0 = 1, b_1 = 3$

B. $b_0 = 0, b_1 = n$

C. $b_0 = -1, b_1 = n$

D. $b_0 = -1, b_1 = n^2 - 3n - 3$

Answer: null

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87. If $0 < x < \frac{\pi}{2}$ and $\sin^n x + \cos^n x \geq 1$, then

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88. If the mapping $f(x) = ax + b, a < 0$ and maps [-1, 1] onto [0, 2] , then for all values of θ, $A = \cos^2\theta + \sin^4\theta$ is such that

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89. If $sec^2\theta = \frac{4xy}{(x+y)^2}$ is true if and only if (a)$x + y \neq 0$ (b) $x = y, x \neq 0$ (c) $x = y$ (d) $x \neq 0, y \neq 0$

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90. If $\frac{2\sin\alpha}{1 + \cos\alpha + \sin\alpha} = y$, then prove that $\frac{1 - \cos\alpha + \sin\alpha}{1 + \sin\alpha}$ is also equal to y.

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91. If

$$f(x) = \sin^2 x + \sin^2\left(x + \frac{\pi}{3}\right) + \cos x \cos\left(x + \frac{\pi}{3}\right) and g\left(\frac{5}{4}\right) = 1,$$

then $(gof)(x)$ is __________

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92. If f(x) $= \cos([\pi]x) + \cos[\pi x]$, where [] is the greatest integer function, then $f\left(\frac{\pi}{2}\right)$ is equal to

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93. If $x_i > 0$ for $1 \leq i \leq n$ and $x_1 + x_2 + x_3 + \ldots + x_n = \pi$ then the greatest value of the sum $\sin x_1 + \sin x_2 + \sin x_3 + \ldots + \sin_n = \ldots$ (A) n (B) π (C) $n \sin \frac{\pi}{n}$ (D) none of these

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94. Let $f(x) = \sin^2 . \frac{x}{2} + \cos^2 . \frac{x}{2}$ and $g(x) = \sec^2 x - \tan^2 x$, the two functions are equal over the set

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95. Prove that: $\left(1+\cos.\frac{\pi}{8}\right)\left(1+\cos.\frac{3\pi}{8}\right)\left(1+\cos.\frac{5\pi}{8}\right)\left(1+\cos.\frac{7\pi}{8}\right)=\frac{1}{8}$

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96. If $0^\circ < \theta < 180^\circ$ then $\sqrt{2+\sqrt{2+\sqrt{2+\ldots+\sqrt{2(1+\cos\theta)}}}}$, then being n number of 2's, is equal to

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97. The minimum value of $3\tan^2\theta + 12\cot^2\theta$ is (A) 6 (B) 15 (C) 24 (D) none of these

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98. If $a = \sin.\frac{\pi}{18}\sin.\frac{5\pi}{18}\sin.\frac{7\pi}{18}$, and x is the solution the equation $y = 2[x] + 2$ and $y = 3[x - 2]$, where $[x]$ denotes the integral part of x, then a is equal to

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99. If alpha is the common positive rootof the equation $x^2 - ax + 12 = 0, x^2 - bx + 15 = 0$ and $x^2 - (a + b)x + 36 = 0$ and $\cos x + \cos 2x + \cos 3x = \alpha$, then $\sin x + \sin 2x + \sin 3x =$ (A) 3 (B) -3 (C) 0 (D) none of these

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100. For any $real\theta$, the maximum value of $\cos^2(\cos\theta) + \sin^2(\sin\theta)$ is

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101. The function $f(x)=\int_{-1}^{x} t\left(e^{t}-1\right)(t-1)(t-2)^{3}(t-3)^{5} dt$ has a local minimum at $x=$ 0 (b) 1 (c) 2 (d) 3

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102. The expression $3\left[\sin^{4}\left(\frac{3}{2}\pi-\alpha\right)+\sin^{4}(3\pi+\alpha)\right]-2\left[\sin^{6}\left(\frac{1}{2}\pi+\alpha\right)+\sin^{6}(5\pi-\alpha)\right]$ is equal to

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103. If in the expansion of $(1+x)^{m}(1-x)^{n}$, the coefficients of x and x^{2} are 3 and - 6 respectively, the value of m and n are

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104. The function $f(x)=\sin^{4}x+\cos^{4}x$ increasing in interval

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105. Let $A = \sin x + \tan x$ and $B = 2x$ in the interval $0 < x < \frac{\pi}{2}$ then

(A) $A > B$ (B) $A = B$ (C) $A < B$ (D) none of these

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106. If $\tan \gamma = \sec \alpha \sec \beta + \tan \alpha \tan \beta$, then $\cos 2\gamma$ is necessarily

(A) ≥ 0 (B) ≤ 0 (C) < 0 (D) > 0

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107. The equation $(\cos p - 1)^x \hat{\ } 2 + (\cos p)x + s \in p = 0$ in the variable x has real roots. The p can take any value in the interval $(0, 2\pi)$

(b) $(- \pi)$ (c) $\left(- \frac{\pi}{2}, \frac{\pi}{2} \right)$ (d) $(, \pi)$

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108. If a,b,c and k are constant quantities and α, β, γ are variable subjects to the relation

$a\tan\alpha + b\tan\beta + c\tan\gamma = k$, then find the minimum value of $\tan^2\alpha + \tan^2\beta + \tan^2\gamma$.

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109. In a ΔABC, prove that $(\sin A + \sin B)(\sin B + \sin C)(\sin C + \sin A) > \sin A \sin B \sin C$.

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110. It is known that $\sin\beta = \frac{4}{5}$ and $0 < \beta < \pi$, then the value of

$$\frac{\sqrt{3}\sin(\alpha+\beta) - \frac{2}{\cos.\frac{11\pi}{6}}\cos(\alpha+\beta)}{\sin\alpha}$$ is

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111. If $\tan\frac{\theta}{2} = (\cos ec\theta - \sin\theta)$, then $\tan^2\frac{\theta}{2}$ may be equal to (A) $2-\sqrt{5}$ (B) $(9-4\sqrt{5})(2+\sqrt{5})$ (C) $-2+\sqrt{5}$ (D) $(9-4\sqrt{5})(2-\sqrt{5})$

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112. In triangle ABC, $\tan A + \tan B + C = 6$ and $\tan A \tan B = 2$, then the values of $\tan A$, $\tan B$, $\tan C$ are respectively.

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113. If $u = \sqrt{a^2\cos^2\theta + b^2\sin^2\theta} + \sqrt{a^2\sin^2\theta + b^2\cos^2\theta}$, then the difference between the maximum and minimum values of u^2 is given by :

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

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114. If

$x = \sin(\alpha - \beta) \cdot \sin(\gamma - \delta), y = \sin(\beta - \gamma) \cdot \sin(\alpha - \delta), z = \sin(\gamma - \alpha) \cdot$

, then :

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115. In ΔABC, prove that

(a) $\sin A \sin B \sin C \leq \frac{3\sqrt{3}}{8}$

(b) $\sin 2A + \sin 2B + \sin 2C \leq \frac{3\sqrt{3}}{2}$

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116. If $\cos^4 \theta + \alpha$ and $\sin^4 \theta + \alpha$ are the roots of the equation $x^2 + 2bx + b = 0$ and $\cos^2 \theta + \beta, \sin^2 \theta + \beta$ are the roots of the equation $x^2 + 4x + 2 = 0$, then values of b are a. 2 b. -1 c. -2 d. 1

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117. If $A+B+C=\pi$, then find the minimum value of $\cot^2 A+\cot^2 B+\cot^2 C$

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118. If $y=\dfrac{\sqrt{1-\sin 4A}+1}{\sqrt{1+\sin 4A}-1}$ then one of the values of y is (A) $-\tan A$ (B) $\cot A$ (C) $\tan\left(\frac{\pi}{4}+A\right)$ (D) $-\cot\left(\frac{\pi}{4}+A\right)$

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119. If $\cos(\theta-\alpha)$, $\cos\theta$, $\cos(\theta+\alpha)$ are in H.P. then $\cos\theta.\ \sec\left(\frac{\alpha}{2}\right)=$

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120. If $f(x)=\cos\left[\pi^2\right]x$, where $[x]$ stands for the greatest integer function, then

(a) $f\left(\frac{\pi}{2}\right)=-1$

(b) $f(\pi) = 1$

(c) $f(-\pi) = 0$

(d) $f\left(\frac{\pi}{4}\right) = \frac{1}{\sqrt{2}}$

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121. If $\sec\theta + \tan\theta = 1$, then one root of the equation $a(b-c)x^2 + b(c-a)x + c(a-b) = 0$ is (A) $\tan\theta$ (B) $\sec\theta$ (C) $\cos\theta$ (D) $\sin\theta$

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122. If $\cos x + \sec x = -2$ then for a positive integer n, $\cos^n x + \sin^n x$ is

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123. If $0 < \theta < \frac{\pi}{2}, x = \sum_{n=0}^{\infty} \cos^{2n}\theta, y = \sum_{n=0}^{\infty} \sin^{2n}\theta$ and $z = \sum_{n=0}^{\infty} \cos^{2n}\theta \cdot \sin^{2n}\theta$, then show $xyz = xy + z$.

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124. The equation $\sin^6 x + \cos^6 x = a^2$ has real solution then find the values of a

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125. If $\tan^2\alpha\tan^2\beta + \tan^2\gamma + \tan^2\gamma\tan^2\alpha + 2\tan^2\alpha\tan^2\beta\tan^2\gamma = 1$, then the value of $\sin^2\alpha + \sin^2\beta + \sin^2\gamma$ is

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126. If $tan\theta = \frac{\sin\alpha - \cos\alpha}{\sin\alpha + \cos\alpha}$, then show that $\sin\alpha + \cos\alpha = \sqrt{2}\cos\theta$

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127. If $\tan A$ and $\tan B$ are the roots of the quadratic equation $x^2 - px + q = 0$ then value of $\sin^2(A + B)$

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128. Stastement - 1 α and β are tow distinct solutions of the equations $a\cos x + b\sin x = c, then \tan\left(\frac{\alpha + \beta}{2}\right)$ is independent for c, Statement 2. Solution $\cos x + b\sin x = c$ is possible, if $-\sqrt{a^2 + b^2} \leq C \leq \sqrt{a^2 + b^2}$

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129. Statement 1. $2^{\sin x} + 2^{\cos x} \geq 2^{1 - \frac{1}{\sqrt{2}}}$ for all real x, Statement 2. For positive numbers, $AM \geq G.M.$ (A) Both Statement 1 and Statement 2 are true and Statement 2 is the correct explanation of Statement 1 (B)

Both Statement 1 and Statement 2 are true and Statement 2 is not the correct explanation of Statement 1 (C) Statement 1 is true but Statement 2 is false. (D) Statement 1 is false but Statement 2 is true

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130. Prove that $\frac{\tan x}{\tan 3x}$ never lies between $\frac{1}{3}$ and 3.

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131. α is a root of equation $(2\sin x - \cos x)(1 + \cos x) = \sin^2 x$, β is a root of the equation $3\cos 2x - 10\cos x + 3 = 0$ and γ is a root of the equation $1 - \sin 2x = \cos x - \sin x : 0 \leq \alpha, \beta, \gamma, \leq \pi/2$

$\sin\alpha + \sin\beta + \sin\gamma$ can be equal to

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132. α is a root of equation $(2\sin x - \cos x)(1 + \cos x) = \sin^2 x$, β is a root of the equation $3\cos 2x - 10\cos x + 3 = 0$ and γ is a root of the equation $1 - \sin 2x = \cos x - \sin x : 0 \leq \alpha, \beta, \gamma, \leq \pi/2$

$\sin\alpha + \sin\beta + \sin\gamma$ can be equal to

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133. α is a root of equation $(2\sin x - \cos x)(1 + \cos x) = \sin^2 x$, β is a root of the equation $3\cos 2x - 10\cos x + 3 = 0$ and γ is a root of the equation $1 - \sin 2x = \cos x - \sin x : 0 \leq \alpha, \beta, \gamma, \leq \pi/2$

$\sin\alpha + \sin\beta + \sin\gamma$ can be equal to

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134. Consider the equation 5sin2x+3sinxcosx-3cos2x=2.......... (i) sin2x-cos2x=2-sin2x.......... (ii) The number of solutions common to equations (1) and (2) is (A) 0 (B) 1 (C) finite (D) infinite

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135. Prove that $\tan 70^0 = 2\tan 50^0 + \tan 20^0$

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136. If $0 < \alpha < \frac{\pi}{4}$ then the range of $\cos ec2\alpha - \cot 2\alpha$ is (A) (0,1) (B) $[1, \infty)$ (C) $\mathbb{R}$ (D) $[0, \infty)$

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137. If a line makes an angle of $\frac{\pi}{4}$ with the positive directions of each of x-axis and y-axis, then the angle that the line makes with the positive direction of z-axis is

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138. $\tan^{2}, \frac{\pi}{16} + \tan^{2}, \frac{2\pi}{16} + \tan^{2}, \frac{3\pi}{16} + \tan^{2}, \frac{5\pi}{16} + \tan^{2}, \frac{6\pi}{16} + \tan^{2}, \frac{7x}{16}$ is equal to

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139. If $\sec A \tan B + \tan A \sec B = 91,$ then the value of $(\sec A \sec B + \tan A \tan B)^{2}$ is equal to

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140. If $\frac{9x}{\cos\theta} + \frac{5y}{\sin\theta} = 56$ and $\frac{9x\sin\theta}{\cos^{2}\theta} - \frac{5y\cos\theta}{\sin^{2}\theta} = 0$ then the value of $\left[(9x)^{\frac{2}{3}} + (5y)^{\frac{2}{3}}\right]^{3}$ is

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141. If $\alpha+\beta=\gamma$ and $\tan\gamma=22$, a is the arithmetic and b is the geometric mean respectively between $\tan\alpha$ and $\tan\beta$, then the value of $\left(\frac{a^3}{(1-b^2)^3}\right)$ is equal to

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142. If $\cos x=\tan y$, $\cos y=\tan z$, $\cos z=\tan x$, thenthe value $\sin x$ is

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143. Prove that, $\sin x.\sin y.\sin(x-y)+\sin y.\sin z.\sin(y-z)+\sin z.\sin x.\sin(z-x)+\sin(x-y).\sin(y-z).\sin(z-x)=0$

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144. If $\tan\alpha=\frac{m}{m+1}$ and $\tan\beta=\frac{1}{2m+1}$, then $\alpha+\beta$ is equal to

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145. It $\cos(\alpha+\beta)=\frac{4}{5}, \sin(\alpha-\beta)=\frac{5}{13} and \alpha, \beta$ lie between $0 and \frac{\pi}{4}$, prove that $\tan 2\alpha=\frac{56}{33}$

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146. Prove that $5\cos\theta+3\cos\left(\theta+\frac{\pi}{3}\right)+3$ lies between -4 and 10.

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147. Find the area of the smaller portion of a disc of radius 10 cm cut off by a chord AB which subtends an angle of $\left(22\frac{1}{2}\right)^{\circ}$ at the circumference.

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148. If $\tan\theta=-\frac{4}{3}, then \sin\theta$ is $-\frac{4}{5} but \neg\frac{4}{5}$ (b) $-\frac{4}{5}$ or $\frac{4}{5}$ $\frac{4}{5} but \neg-\frac{4}{5}$ (d) none of these

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149. If $\alpha+\beta+\gamma=2\pi$, then

$\frac{\tan\alpha}{2}\frac{\tan\beta}{2}+\frac{\tan\gamma}{2}=\frac{\tan\alpha}{2}\frac{\tan\beta}{2}\frac{\tan\gamma}{2}$

$\frac{\tan\alpha}{2}\frac{\tan\beta}{2}+\frac{\tan\beta}{2}\frac{\tan\gamma}{2}+\frac{\tan\gamma}{2}\frac{\tan\alpha}{2}=1$

$\frac{\tan\alpha}{2}+\frac{\tan\beta}{2}+\frac{\tan\gamma}{2}=-\frac{\tan\alpha}{2}\frac{\tan\beta}{2}\frac{\tan\gamma}{2}$ none of these

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150. The greatest value of $\sin^4\theta+\cos^4\theta$ is

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151. Given $\alpha+\beta+\gamma=\pi$, prove that

$\sin^2\alpha+\sin^2\beta-\sin^2\gamma=2\sin\alpha\sin\beta\cos\gamma\cdot$

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152. For all θ in $[0, \pi/2]$ show that $\cos(\sin\theta) \geq \sin(\cos\theta)$

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153. Without using tables, prove that $(\sin 12^0)(\sin 48^0)(\sin 54^0) = \frac{1}{8}$

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154. If $\tan A = \frac{1 - \cos B}{\sin B}$, then $\tan 2A = \tan B$

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155. The larger of $\cos[\log(\theta)]$ and $\log(\cos\theta)$ if $e^{-\frac{\pi}{2}} < \theta < \frac{\pi}{2}$ is

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156. Prove that $\cos\left(\frac{2\pi}{15}\right)\cos\left(\frac{4\pi}{15}\right)\cos\left(\frac{8\pi}{15}\right)\cos\left(\frac{16\pi}{15}\right) = \frac{1}{16}$

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157. The value of $\left(1+\frac{\cos\pi}{8}\right)\left(1+\frac{\cos(3\pi)}{8}\right)\left(1+\frac{\cos(5\pi)}{8}\right)\left(1+\frac{\cos(7\pi)}{8}\right) is$ 1/4 (b) 3/4 (c) 1/8 (d) 3/8

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158. The expression $3\left[\sin^4\left(\frac{3}{2}\pi-\alpha\right)+\sin^4(3\pi+\alpha)\right]-2\left[\sin^6\left(\frac{1}{2}\pi+\alpha\right)+\sin^6(5\pi-\alpha)\right]$ is equal to

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159. The number of all the possible triplets (a_1, a_2, a_3) such that $a_1+a_2\cos(2x)+a_3\sin^2(x)=0$ for all x is (a) 0 (b) 1 (c) 3 (d) infinite

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160. The side of a triangle inscribed in a given circle subtends angles $\alpha, \beta and \gamma$ at the centre. The minimum value of the arithmetic mean of $\cos\left(\alpha + \frac{\pi}{2}\right), \cos\left(\beta + \frac{\pi}{2}\right)$, and $\cos\left(\gamma + \frac{\pi}{2}\right)$ is equal to ____

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161. Prove that

$\tan\alpha + 2\tan 2\alpha + 4\tan 4\alpha + 8\cos 8\alpha = \cot\alpha$

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162. about to only mathematics

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163. If $f(x) = \cos\left[\pi^2\right]x,$ where $[x]$ stands for the greatest integer function, then (a) $f\left(\frac{\pi}{2}\right) = 0$ (b) $f(\pi) = 1$ (c) $f(-\pi) = 0$ (d)

$f\left(\frac{\pi}{4}\right) = 1$

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164. Prove that $\frac{\tan 3x}{\tan x}$ never lies between $\frac{1}{3} and 3$.

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165. If $0 < \theta < \frac{\pi}{2}, x = \sum_{n=0}^{\infty} \cos^{2n}\theta, y = \sum_{n=0}^{\infty} \sin^{2n}\theta$ and $z = \sum_{n=0}^{\infty} \cos^{2n}\theta \cdot \sin^{2n}\theta$, then show $xyz = xy + z$.

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166. If $K = \sin\left(\frac{\pi}{18}\right)\sin\left(\frac{5\pi}{18}\right)\sin\left(\frac{7\pi}{18}\right)$, then the numerical value of K is_____

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167. For all values of $A, B, CandP, Q, R$ show that

$|\cos(A-P)\cos(A-Q)\cos(A-R)\cos(B-P)\cos(B-Q)\cos(B-R)\cos$

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168. The number of points of intersection of two curves

$y = 2\sin x andy = 5x^2 + 2x + 3is$ 0 b. 1 c. 2 d. ∞

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169. Let `0

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170. Let n be a positive integer such that $\frac{\sin\pi}{2n} + \frac{\cos\pi}{2n} = \frac{\sqrt{n}}{2}$. Then

$6 \leq n \leq 8$ (b) `4

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172. If $sec^2\theta = \frac{4xy}{(x+y)^2}$ is true if and only if (a)$x+y \neq 0$ (b) $x=y, x \neq 0$ (c) $x=y$ (d) $x \neq 0, y \neq 0$

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173. If $\cos(x-y)$, $\cos x$ and $\cos(x+y)$ are in HP, then $\cos x \sec\left(\frac{y}{2}\right) =$

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175. Prove that $\frac{\tan x}{\tan 3x}$ never lies between $\frac{1}{3}$ and $3.$

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178. Which of the following number(s) is/are rational? $\sin 15^0$ (b) $\cos 15^0$ $\sin 15^0 \cos 15^0$ (d) $\sin 15^0 \cos 75^0$

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179. Let $f(\theta) = \sin\theta(\sin\theta + \sin 3\theta)$. Then $f(\theta) is \geq 0 only when \theta \geq 0$

(b) $\leq 0 f$ or $all rea < h\eta$ $\geq 0 f$ or $all rea < h\eta$ (d)

$\leq 0 only when \theta \leq 0$

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180. If $\alpha + \beta = \frac{\pi}{2}$ and $\beta + \gamma = \alpha$, then $\tan\alpha$ equals

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181. The length of the longest interval in which the function $3\sin x - 4\sin^3 x$ is increasing is $\frac{\pi}{3}$ (b) $\frac{\pi}{2}$ (c) $\frac{3\pi}{2}$ (d) π

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182. If $\alpha \in \left(0, \frac{\pi}{2}\right), then \sqrt{x^2 + x} + \frac{\tan^2\alpha}{\sqrt{x^2 + x}}$ is always greater than or equal to $2\tan\alpha$ 1 $2\sec^2\alpha$

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183. If $\frac{\sin^4 x}{2}+\frac{\cos^4 x}{3}=\frac{1}{5} then$ $\tan^2 x=\frac{2}{3}$ (b) $\frac{\sin^8 x}{8}+\frac{\cos^8 x}{27}=\frac{1}{125}$ $\tan^2 x=\frac{1}{3}$ (d) $\frac{\sin^8 x}{8}+\frac{\cos^8 x}{27}=\frac{2}{125}$

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184. Two parallel chords of a circle of radius 2 are at a distance. $\sqrt{3+1}$ apart. If the chord subtend angles $\frac{\pi}{k}$ and $\frac{2\pi}{k}$ at the center, where $k>0,$ then the value of [k] is

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185. The maximum value of the expression

$\frac{1}{\sin^2\theta+3\sin\theta\cos\theta+5\cos^2\theta}$ is ________.

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186. In a $\Delta PQR, \angle R = \frac{\pi}{2}$. If $\tan\left(\frac{P}{2}\right)$ and $\tan\left(\frac{Q}{2}\right)$ are the roots of $ax^2 + bx + c = 0, a \neq 0$, then :

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187. The value of $\frac{1 - \tan^2 15^\circ}{1 + \tan^2 15^\circ}$ is

A. (A) 1

B. (B) $\sqrt{3}$

C. (C) $\frac{\sqrt{3}}{2}$

D. (D) 2

Answer: null

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188. If $\sin(\alpha + \beta) = 1, \sin(\alpha - \beta) = \frac{1}{2}$ then, $\tan(\alpha + 2\beta)\tan(2\alpha + \beta)$ is equal to :

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189. $\cos\alpha\sin(\beta-\gamma)+\cos\beta\sin(\gamma-\alpha)+\cos\gamma\sin(\alpha-\beta)=$

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190. Let α and β be such that $\pi<\alpha-\beta<3\pi$, If $\sin\alpha+\sin\beta=-\frac{21}{65}$ and $\cos\alpha+\cos\beta=-\frac{27}{65}$, then the value of $\frac{\cos(\alpha-\beta)}{2} is$ (a) $-\frac{3}{\sqrt{130}}$ (b) $\frac{3}{\sqrt{130}}$ (c) $\frac{6}{25}$ (d) $\frac{6}{65}$

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191. Let A and B denote the statements A: $\cos\alpha+\cos\beta+\cos\gamma=0$ B : $\sin\alpha+\sin\beta+\sin\gamma=0$ If $\cos(\beta-\gamma)+\cos(\gamma-\alpha)+\cos(\alpha-\beta)=-(3/2)$, then (1) A is true and B is false (2) A is false and B is true (3) both A and B are true (4) both A and B are false

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192. Let $\cos(\alpha+\beta)=\frac{4}{5}$ and let $\sin(\alpha+\beta)=\frac{5}{13}$ where $0 \le \alpha, \beta \le \frac{\pi}{4}$, then $tan2\alpha =$ (1) $\frac{56}{33}$ (2) $\frac{19}{12}$ (3) $\frac{20}{7}$ (4) $\frac{25}{16}$

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193. For a regular polygon, let r and R be the radii of the inscribed and the cirumscribed circles, respectively. A false statement among the following is

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