MATHS

BOOKS - ML KHANNA

TRIGONOMETRY RATIOS AND IDENTITIES

PROBLEM SET (1) (MULTIPLE CHOICE QUESTIONS)

1. What is the value of $\sin^6\theta + \cos^6\theta + 3\sin^2\theta\cos^2\theta$?

A. 0

B. 1

C. 2

D. 3

Answer: B

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2. $2(\sin^6 A + \cos^6 A) - 3(\sin^4 A + \cos^4 A)$ is

A. 2

B. 0

C. -1

D. none

Answer: C

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3. Find the value of the expression

$$3\left[\sin^4\left(\frac{3\pi}{2} - \alpha\right) + \sin^4(3\pi + \alpha)\right] - 2\left[\sin^6\left(\frac{\pi}{2} + \alpha\right) + \sin^6(5\pi - \alpha)\right]$$

.

A. 0

B. 1

C. 3

D. $\sin 4\alpha + \sin 6\alpha$

Answer: B

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

A. 9

B. 10

C. 13

D. 6

Answer: C

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5. If $k = \sin^6 c + \cos^6 x,$ then k belongs to the interval

A. $\left[\frac{7}{8}, \frac{5}{4}\right]$

B. $\left[\frac{1}{2}, \frac{5}{8}\right]$

C. $\left[\frac{1}{4}, 1\right]$

D. none of these

Answer: C

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6. The value of $\sin^2 a \cos^2 a \left(\sec^2 a + \cos ec^2 a\right)$ is

A. 2

B. 4

C. 1

D. 0

Answer: C

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7. If $x = a\cos^2\theta\sin\theta$ and $y = a\sin^2\theta\cos\theta$, then $\left(x^2 + y^2\right)^3$ is

A. a^2x^2/y^2

B. $a^2x^2y^2$

C. $a^2\left(x^2 - y^2\right)$

D. none

Answer: B

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8. If $\sin a + \cos eca = 2$, then $\sin^2 a + \cos ec^2 a$ is equal to

A. 1

B. 4

C. 2

D. none

Answer: C

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9. If $\sin x + \cos esx = 2, then \sin^n x + \cos ec^n x$ is equal to

A. 2

B. 2^n

C. 2^{n-1}

D. 2^{n-2}

Answer: A

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10. If $0 \leq \theta \leq \pi$ and $81^{\sin^2\theta} + 81^{\cos^2\theta} = 30$ then θ is

A. 30°

B. 60°

C. 120°

D. 150°

Answer: A::B

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11. If $\sin(a+b) = 1, \sin(a-b) = \frac{1}{2}, a, b \in [0, \pi/2]$, then $\tan(a+2b)\tan(2a+b) =$

A. 1

B. 2

C. -1

D. none

Answer: A

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12. Incorrect statement is

A. $\sin\theta = -\frac{1}{5}$

B. $\cos\theta = 1$

C. $\sec\theta = \frac{1}{2}$

D. $\tan\theta = 20$

Answer: C

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13. If

$(\sec A + \tan A)(\sec B + \tan B)(\sec C + \tan C) = (\sec A - \tan A)(\sec B -$

then each side is equal to

A. 1

B. -1

C. 0

D. none

Answer: A::B

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14. If $\cos ec\theta = a + \frac{1}{4a}$, then the value of $\cos ec\theta + \cot\theta$ is

A. $-2a$

B. 2a

C. $-\frac{1}{2a}$

D. $\frac{1}{2a}$

Answer: B

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15. If

$$(1+\sin A)(1+\sin B)(1+\sin C)=(1-\sin A)(1-\sin B)(1-\sin C)$$

, then each side is equal to

A. $\pm$ sin A sin B sinC

B. $\pm$ cos A cos B cos C

C. $\pm$ sin A cos B cos C

D. $\pm$ cos A sin B sin C

Answer: B

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16. The maximum value of $(\cos\alpha_1)-(\cos\alpha_2)\ldots(\cos\alpha_n)$,

under the restrictions $0\leq\alpha_1,\alpha_2\ldots,\alpha_n\leq\frac{\pi}{2}$ and

$(\cot\alpha_1)-(\cot\alpha_2)\ldots\ldots(\cot\alpha_n)=1$ is

A. $\frac{1}{2^{n/2}}$

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

C. $\frac{1}{2n}$

D. 1

Answer: A

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17. If $(\sec\theta + \tan\theta)(\sec\phi + \tan\phi)(\sec\Psi + \tan\Psi) = \tan\theta.\tan\phi.\tan\Psi$, then $(\sec\theta - \tan\theta)(\sec\phi - \tan\phi)(\sec\Psi - \tan\Psi) =$

A. $\cot\theta\cot\phi\cot\Psi$

B. $\tan\theta\tan\phi\tan\Psi$

C. $\tan\theta + \tan\phi + \tan\Psi$

D. $\cot\theta + \cot\phi + \cot\Psi$

Answer: A

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18. $(1+\tan\alpha\tan\beta)^2+(\tan\text{alpha}-\tan\text{beta})^2=\quad\tan^2\alpha\tan^2\beta$ (b) $\sec^2\alpha\sec^2\beta\tan^2\alpha\cot^2\beta$ (d) $\sec^2\alpha\cos^2\beta$

A. $\tan^2\alpha\tan^2\beta$

B. $\sec^2\alpha\sec^2\beta$

C. $\tan^2\alpha\cot^2\beta$

D. $\sec^2\alpha\cos^2\beta$

Answer: B

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19. If $\cos ec\theta-\cot\theta=q$, then the value of $\cos ec\theta$ is

A. $q+\dfrac{1}{q}$

B. $q-\dfrac{1}{q}$

C. $\frac{1}{2}\left(q+\frac{1}{q}\right)$

D. none

Answer: C

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20. $(\cos ec\theta + \sin\theta)(\sec\theta - \cos\theta)\tan\theta + \cot\theta)$ is equal to

A. $\sin\theta\cos\theta$

B. $\sec\theta\cos ec\theta$

C. 1

D. none

Answer: C

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21. $\dfrac{\tan A + \sec A - 1}{\tan A - \sec A + 1} =$

A. $\dfrac{1 + \cos A}{\sin A}$

B. $\dfrac{1 + \sin A}{\cos A}$

C. $\dfrac{1 - \cos A}{1 + \cos A}$

D. $\dfrac{1 + \sin A}{1 - \sin A}$

Answer: B

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22. The value of $(1 + \cot\theta - \cos ec\theta)(1 + \tan\theta - \sec\theta)$ is

A. 1

B. 2

C. 3

D. none

Answer: B

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23. The expression

$$\cos ec^2 A \cot^2 A - \sec^2 A \tan^2 A - \left(\cot^2 A - \tan^2 A\right)\left(\sec^2 A \cos ec^2 A - 1\right)$$

is equal to

A. $\tan^2 A - \cot^2 A$

B. $\sec^2 a - \cos ec^2 A$

C. 0

D. none

Answer: C

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24. The value of cos $1^\circ \cos 2^\circ \cos 3^\circ$ .....cos 179° is

A. $1/\sqrt{2}$

B. 0

C. 1

D. none of these

Answer: B

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25. The value of (tan $1^\circ \tan 2^\circ \tan 3^\circ \ldots \tan 89^\circ$) is

A. ∞

B. 0

C. 1

D. $1/2$

Answer: C

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26. If $4n\alpha = \pi$, then the value of $\tan\alpha \cdot \tan 2\alpha \cdot \tan 3\alpha \ldots\ldots \tan(2n-2)\alpha \tan(2n-1)\alpha$ is:

A. 1

B. 0

C. -1

D. none

Answer: D

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27. The value of $\cot 5^\circ . \cot 10^\circ . \cot 15^\circ \ldots\ldots .\cot 85^\circ$ is

A. 0

B. $\frac{1}{\sqrt{2}}$

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

D. 1

Answer: D

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28. The value of $e^{\log_{10}\tan 1^\circ + \log_{10}\tan 2^\circ + \log_{10}\tan 3^\circ + ... + \log_{10}\tan 89^\circ}$ is

A. 0

B. e

C. $1/e$

D. none of these

Answer: D

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29. Find the value of $\tan.\frac{\pi}{20}\tan.\frac{3\pi}{20}\tan.\frac{5\pi}{20}\tan.\frac{7\pi}{20}\tan.\frac{9\pi}{20}.$

A. -1

B. 1

C. $1/2$

D. ∞

Answer: B

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30. The value of $\frac{\cot 54^\circ}{\tan 36^\circ} + \frac{\tan 20^\circ}{\cot 70^\circ}$ is

A. 0

B. 1

C. 2

D. -3

Answer: C

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31. If $\theta = \frac{\pi}{4n}$ then the value of $\tan\theta\tan 2\theta \ldots\ldots \tan(2n-2)\theta\tan(2n-1)\theta$ is

A. -1

B. 1

C. 0

D. 2

Answer: B

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32. $\sin^2 5^\circ + \sin^2 10^\circ + \sin^2 15^\circ + \ldots\ldots + \sin^2 85^\circ + \sin^2 90^\circ$ is equal to

A. 7

B. 8

C. 9

D. $9\frac{1}{2}$

Answer: D

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33. Find the value of : $\sin^2\left(\frac{\pi}{18}\right) + \sin^2\left(\frac{\pi}{9}\right) + \sin^2\left(\frac{7\pi}{18}\right) + \sin^2\left(\frac{4\pi}{9}\right)$

A. 1

B. 4

C. 2

D. 0

Answer: C

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34. If $\tan\theta = \frac{1}{2}$ and $\tan\phi = \frac{1}{3}$, then the value of $\theta + \phi$ is

A. $\pi/6$

B. π

C. zero

D. $\pi/4$

Answer: D

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35. If $x \neq n\pi$ where n is any integer and $\frac{1+\tan x}{1-\tan x} = 1 + \sin 2x$, then $\tan x =$

A. 1

B. -1

C. 3

D. 4

Answer: B

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36. $\tan 75^\circ - \cot 75^\circ =$

A. $2\sqrt{3}$

B. $2 + \sqrt{3}$

C. $2 - \sqrt{3}$

D. none of these

Answer: A

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37. Show that

$2\sin^2\beta + 4\cos(\alpha + \beta)\sin\alpha \sin\beta + \cos 2(\alpha + \beta) = \cos 2\alpha.$

A. $\sin 2\alpha$

B. $\cos 2\beta$

C. $\cos 2\alpha$

D. $\sin 2\beta$

Answer: C

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38. If $x = \dfrac{2\sin\theta}{1+\cos\theta+s\int h\eta}$, then prove that $\dfrac{1-\cos\theta+s\int h\eta}{1+s\int h\eta}$ is equal to x .

A. $1+x$

B. $1-x$

C. x

D. $\dfrac{1}{x}$

Answer: C

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39. $(a+2)\sin\alpha + (2a-1)\cos\alpha = (2a+1)$ if $\tan\alpha$ is $\frac{3}{4}$ (b) $\frac{4}{3}$ (c) $2a(a^2+1)$ (d) $2a(a^2-1)$

A. $\frac{3}{4}$

B. $\frac{4}{3}$

C. $\frac{2a}{a^2+1}$

D. $\frac{2a}{a^2-1}$

Answer: B::D

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40. If angle C of triangle ABC is 90^0, then prove that $\tan A + \tan B = \frac{c^2}{ab}$ (where, $a, b, c,$ are sides opposite to angles $A, B, C,$ respectively).

A. $\frac{a^2}{bc}$

B. $\frac{b^2}{ca}$

C. $\frac{c^2}{ab}$

D. $a+b$

Answer: C

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41. $1-\frac{\sin^2\theta}{1+\cos\theta}+\frac{1+\cos\theta}{\sin\theta}-\frac{\sin\theta}{1-\cos\theta}=$

A. $\sin\theta$

B. $\cos\theta$

C. 1

D. 0

Answer: B

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42. Let $f(\theta) = \sin\theta(\sin\theta + \sin 3\theta)$. Then $f(\theta)$

A. $\geq$ 0 only when $\theta \geq 0$

B. ≤ 0 for all real θ.

C. ≥ 0 for all real θ

D. $\geq$ only when $\theta \geq$ 0

Answer: C

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43. If A and B are positive acute angles satisfying the equalities $3\cos^2 A + 2\cos^2 B = 4$ and $\frac{3\sin A}{\sin B} = \frac{2\cos B}{\cos A}$, then $A + 2B$ is equal to

A. $\pi/4$

B. $\pi/3$

C. $\pi/6$

D. $\pi/2$

Answer: D

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44. If α and β are $+$ ive acute angle satisfying the equation $3\sin^2\alpha + 2\sin^2\beta = 1$ and $3\sin 2\alpha - 2\sin 2\beta = 0$, then $\alpha + 2\beta =$

A. $\pi/2$

B. $2\pi/3$

C. π

D. none

Answer: A

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45. $\alpha, \beta, \gamma and \delta$ are the smallest positive angle in ascending order of magnitude which have their sines equal to the positive quantity k. The value of $4\frac{\sin\alpha}{2} + 3\frac{\sin\beta}{2} + 2\frac{\sin\gamma}{2} + \frac{\sin\delta}{2}$ is equal to

A. $2\sqrt{1-k}$

B. $2\sqrt{1+k}$

C. $2\sqrt{k}$

D. none of these

Answer: B

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46. In any triangle ABC, $\sin A - \cos B = \cos C$, then angle B is

A. $\frac{\pi}{2}$

B. $\frac{\pi}{3}$

C. $\frac{\pi}{4}$

D. $\frac{\pi}{6}$

Answer: A

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47. If $2\sec 2\theta = \tan\Psi + \cot\Psi$ then one of the values of $\theta + \Psi =$

A. $\pi/2$

B. $\pi/4$

C. $\pi/3$

D. none

Answer: B

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48. If $f(x) = \dfrac{10\cos x + 5\cos 3x + \cos 5x}{\cos 6x + 6\cos 4x + 15\cos 2x + 10}$ then $f(0) + f'(0) + f''(0) =$

A. $-\dfrac{1}{2}$

B. 0

C. $\dfrac{1}{2}$

D. 1

Answer: D

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49. If $\sin x + \sin^2 x = 1$,then $\cos^4 x + \cos^2 x = ?$

A. 1

B. 2

C. 1.5

D. none of these

Answer: A

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50. If $\sin x + \sin^2 x = 1$, then $\cos^8 x + 2\cos^6 x + \cos^4 x$

A. 0

B. -1

C. 2

D. 1

Answer: D

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51. If $\sin x + \sin^2 x = 1$, then the value of $\cos^{12} x + 3\cos^{10} x + 3\cos^8 x + \cos^6 x + 2\cos^4 x + \cos^2 x - 2$ is equal to

A. 0

B. 1

C. 2

D. $\sin^2 x$

Answer: D

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52. If $\sin\theta + \sin^2\theta + \sin^3\theta = 1$, then find the value of $\cos^6\theta - 4\cos^4\theta + 8\cos^2\theta$.

A. 4

B. 2

C. 1

D. none

Answer: A

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53. If $\sin 2\theta = \cos 3\theta$ and θ is an acute angle, then $\sin\theta$ equals

A. $\frac{\sqrt{5}-1}{4}$

B. $-\left(\frac{\sqrt{5}-1}{4}\right)$

C. $\frac{\sqrt{5}+1}{4}$

D. $\frac{-\sqrt{5}-1}{4}$

Answer: A

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54. $\sin 10^\circ + \sin 20^\circ + \sin 30^\circ + \ldots + \sin 360^\circ$ is equal to

A. 1

B. 0

C. -1

D. none of these

Answer: B

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55. $\tan 20^\circ + \tan 40^\circ + \tan 60^\circ + \ldots\ldots\ldots + \tan 160^\circ + \tan 180^\circ =$

A. 1

B. 2

C. 0

D. none

Answer: C

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56. $\dfrac{\sin^2 3A}{\sin^2 A} - \dfrac{\cos^2 3A}{\cos^2 A} =$

A. cos 2A

B. 8 cos 2A

C. $\frac{1}{8}\cos 2A$

D. None of these

Answer: B

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57. If $\sin\theta_1 + \sin\theta_2 + \sin\theta_3 = 3$ then $\cos\theta_1 + \cos\theta_2 + \cos\theta_3$ is equal to

A. 3

B. 2

C. 1

D. 0

Answer: D

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58. If A lies in the third quardrant and 3 tan A -4 =0 , then 5 sin 2A+3 sin A + 4 cos A is equal to

A. 0

B. $-\frac{24}{5}$

C. $\frac{24}{5}$

D. $\frac{48}{5}$

Answer: A

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59. If $\cos\alpha + \cos\beta = 0 = \sin\alpha + \sin\beta$, then $\cos 2\alpha + \cos 2\beta =$

A. $-2\sin(\alpha+\beta)$

B. $-2\cos(\alpha+\beta)$

C. $2\sin(\alpha+\beta)$

D. $2\cos(\alpha+\beta)$

Answer: B

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60. If $\cos x+\cos y+\cos\alpha=0$ and $\sin x+\sin y+\sin\alpha=0$, then $\frac{\cot(x+y)}{2}=$

A. $\sin\alpha$

B. $\cos\alpha$

C. $\cot\alpha$

D. $2\sin\alpha$

Answer: C

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61. In a triangle PQR, $\angle R = \pi/2$. If tan (P/2) and tan (Q/2) are the roots of the equations $ax^2 + bx + c = 0$ where $a \neq 0$, then

A. $a + b = c$

B. $b + c = a$

C. $a + c = b$

D. $b = c$

Answer: A

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62. If $(1 + \tan\alpha)(1 + \tan 4\alpha) = 2, \alpha \in \left(0, \frac{\pi}{16}\right)$, then α is equal to $\frac{\pi}{20}$ (b) $\frac{\pi}{30}$ (c) $\frac{\pi}{40}$ (d) $\frac{\pi}{60}$

A. $\frac{\pi}{20}$

B. $\frac{\pi}{30}$

C. $\frac{\pi}{40}$

D. $\frac{\pi}{60}$

Answer: A

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63. If α and β are acute such that $\alpha+\beta$ and $\alpha-\beta$ satisfy the equation $\tan^2\theta-4\tan\theta+1=0$, then (α,β) =

A. $(30^\circ, 60^\circ)$

B. $(45^\circ, 45^\circ)$

C. $(45^\circ, 30^\circ)$

D. $(60^\circ, 45^\circ)$

Answer: C

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64. 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 (5/4) = 1, then (gof) x is

A. 0

B. 1

C. 2

D. none

Answer: B

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65. If $m \tan(\theta - 30^\circ) = n \tan(\theta + 120^\circ)$, then $\frac{m+n}{m-n} = ?$

A. $\sin 2\theta$

B. $2\cos 2\theta$

C. $\tan 2\theta$

D. none

Answer: B

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66. If $y = \frac{\sqrt{1 - \sin 4x} + 1}{\sqrt{1 + \sin 4x} - 1}$, then y can be

A. cotx

B. $-\tan x$

C. $-\cot\left(\frac{\pi}{4} + x\right)$

D. $\tan\left(\frac{\pi}{4} + x\right)$

Answer: A::B::C::D

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67. Let A and B denote the statements

$A: \cos\alpha + \cos\beta + \cos\gamma = 0$

$B: \sin\alpha + si \in \beta + \sin\gamma = 0$

If $\cos(\beta-\gamma)+\cos(\gamma-\alpha)+\cos(\alpha-\beta)=-\frac{3}{2}$,

then

A. both A and B are false

B. A is true and B is false

C. A is false and B is true

D. both A and B are true

Answer: D

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PROBLEM SET (1) TRUE AND FALSE

1. Prove $\frac{1}{\sec x-\tan x}-\frac{1}{\cos x}=\frac{1}{\cos x}-\frac{1}{\sec x+\tan x}$

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2. The equality $\sin A + \sin 2A + \sin 3A = 3$ holds for some real value of A.

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3. If $\sin\theta + \cos\theta = x$, Prove that : $\sin^6\theta + \cos^6\theta = \dfrac{4 - 3\left(x^2 - 1\right)^2}{4}$

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4. $2^{\sin^2 x} = \sin x$

does not hold good for any real x.

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5. If $f_n = \sin^n\theta + \cos^n\theta$, then $\dfrac{f_3 - f_5}{f_1} = \dfrac{f_5 - f_7}{f_3}$ True of false

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PROBLEM SET (1) FILL IN THE BLANKS

1. If A,B,C be all acute angles and $\sin(B+C-A)=\cos(C+A-B)=\tan(A+B-C)=1,$ then $A=\ldots\ldots\ldots\ldots,B=\ldots\ldots\ldots\ldots,C=\ldots\ldots\ldots\ldots\ldots\ldots$

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2. If $x^2+y^2=1$ and $P=\left(3x-4x^3\right)^2+\left(3y-4y^3\right)^2,$ then $P=\ldots\ldots\ldots\ldots\ldots$

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PROBLEM SET (2) (MULTIPLE CHOICE QUESTIONS)

1. Find the least value of $2\sin^2\theta+3\cos^2\theta.$

A. 1

B. 2

C. 3

D. 5

Answer: B

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2. The least values of $\cos ec^2 x + 25 \sec^2 x$ is

A. 36

B. 28

C. 26

D. 0

Answer: A

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

A. $1/2$

B. 1

C. 2

D. 3

Answer: B

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4. If $f(x) = \cos^2 x + \sec^2 x$, then

A. $f(x) < 1$

B. $f(x) = 1$

C. $2 > f(x) > 1$

D. $f(x) \geq 2$

Answer: D

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5. Prove that $\frac{3}{4} \leq \sin^2\theta + \cos^4\theta \leq 1$ for all real θ.

A. $1 \leq A \leq 2$

B. $3/4 \leq A \leq 1$

C. $13/16 \leq A \leq 1$

D. $3/4 \leq A \leq 13/16$

Answer: B

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6. If $A = \sin^8\theta + \cos^{14}\theta$, then for all values of θ,

A. $A \geq 1$

B. $0 < A \leq 1$

C. $1/2 < A \leq 3/2$

D. none of these

Answer: B

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7. If θ, ϕ are acute, $\sin\theta = 1/2, \cos\phi = 1/3$, then $[\theta + \phi] \in$

A. $(\pi/3, \pi/2)$

B. $(\pi/2, 2\pi/3)$

C. $(2\pi/3, 5\pi/6)$

D. $(5\pi/6, \pi)$

Answer: B

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8. The value of $\cos 10^\circ - \sin 10^\circ$ is

A. positive

B. negative

C. 0

D. 1

Answer: A

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9. Which of the following is correct ?

A. $\sin 1^\circ > \sin 1$

B. $\sin 1^\circ < \sin 1$

C. $\sin 1^\circ = \sin 1$

D. $\sin 1^\circ = \frac{\pi}{180} \sin 1$

Answer: B

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10. Maximum value of $24\sin\theta + 7\cos\theta$ is

A. 1

B. 24

C. 25

D. 7

Answer: C

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11. The minimum value of $3\sin\theta + 4\cos\theta$ is

A. 1

B. 3

C. -5

D. 5

Answer: C

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12. Maximum value of $3\cos\theta + 4\sin\theta$ is

A. 3

B. 4

C. 5

D. none

Answer: C

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13. The minimum value of $3\cos x + 4\sin x + 8$ is:

A. 5

B. 9

C. 7

D. 3

Answer: D

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

A. $-4, 10$

B. 5,12

C. $-5, 12$

D. $-4, 5$

Answer: A

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15. If $a \leq 3\cos x + 5\sin(x - \pi/6) \leq b$ for all x, then (a,b) =

A. $\left(-\sqrt{19}, \sqrt{19}\right)$

B. $(-17, 17)$

C. $\left(-\sqrt{21}, \sqrt{21}\right.$

D. none

Answer: A

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16. If $a\cos\theta - b\sin\theta = \lambda$, then $\forall$ real θ

A. $\lambda > \sqrt{a^2 + b^2}$

B. $\lambda < -\sqrt{a^2+b^2}$

C. $-\sqrt{a^2+b^2} \leq \lambda \leq \sqrt{a^2+b^2}$

D. none

Answer: C

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17. $\sqrt{3}\sin x + \cos x$ is maximum when x is

A. 30°

B. 90°

C. 60°

D. 45°

Answer: C

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18. The set of values of 'a' for which the equation

$\sqrt{a}\cos x - 2\sin x = \sqrt{2} + \sqrt{2-a}$ has a solution is

A. $p > 0$

B. $p \leq 3$

C. $0 \leq p \leq 2$

D. $\sqrt{5} - 1 \leq p \leq 2$

Answer: D

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19. Given $12\sin\theta + 5\cos\theta = 2x^2 - 8x + 21$ and θ and x are the solutions of above then θ x is

A. $\pi - 2\tan^{-1}\frac{5}{12}$

B. $\pi - 2\tan^{-1}\frac{12}{5}$

C. 0

D. none

Answer: A

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20. If $\cos 25^\circ + \sin 25^\circ = 0$, then: $\cos 50^\circ =$

A. $\sqrt{2-p^2}$

B. $-\sqrt{2-p^2}$

C. $p\sqrt{2-p^2}$

D. $-p\sqrt{2-p^2}$

Answer: C

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21. The equation $\sin x(\sin x + \cos x) = k$ has real solution if and only if k is a real number such that

A. $0 \leq k \leq \frac{1+\sqrt{2}}{2}$

B. $2-\sqrt{3} \leq k \leq 2+\sqrt{3}$

C. $0 \leq k \leq 2-\sqrt{3}$

D. $\frac{1-\sqrt{2}}{2} \leq k \leq \frac{1+\sqrt{2}}{2}$

Answer: D

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22. The maximum value of $12\sin\theta - 9\sin^2\theta$ is

A. 3

B. 4

C. 5

D. none of these

Answer: B

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23. $\cos 2\theta + 2\cos\theta$ is always

A. greater than $-3/2$

B. less than or equal to $3/2$

C. greater than or equal to $-3/2$

D. none of these

Answer: C

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24. If l,g are the least and greatest values of $9\cos 2\theta - 24\cos\theta - 20$ than (l ,g) is equal to

A. $(-35, 35)$

B. $(-35, -13)$

C. $(-37, 13)$

D. $(-37, -35)$

Answer: C

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25. The ratio of the greatest value of $2 - \cos x + s \in^2 x$ to its least value is $\frac{7}{4}$ (2) $\frac{9}{4}$ (3) $\frac{13}{4}$ (4) $\frac{5}{4}$

A. $1/4$

B. $9/4$

C. $13/4$

D. none

Answer: C

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26. If $\cos A = \frac{3}{4}$ then the value of $32\sin\left(\frac{A}{2}\right) \cdot \sin\left(5\frac{A}{2}\right)$ is____.

A. 7

B. 8

C. 11

D. none

Answer: C

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27. The value of $\sin^3 10^0 + \sin^3 50^0 - \sin^3 70^0$ is equal to $-\frac{3}{2}$ (b) $\frac{3}{4}$ (c) $-\frac{3}{4}$ (d) $-\frac{3}{8}$

A. $-\frac{3}{2}$

B. $\frac{3}{4}$

C. $-\frac{3}{4}$

D. $-\frac{3}{8}$

Answer: D

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28. If $y = 4\sin^2\theta - \cos 2\theta$, then y lies in the interval

A. [2,4]

B. [1,5]

C. [-1,5]

D. [2,-4]

Answer: C

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29. If $x = \frac{4\lambda}{1+\lambda^2}$ and $y = \frac{2-2\lambda^2}{1+\lambda^2}$, where λ is a real parameter then $Z = x^2 - xy + y^2$ lies between

A. [2,6]

B. [2,4]

C. [4,6]

D. none

Answer: A

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30. The equation $\sin^2\theta = \frac{x^2+y^2}{2xy}, x, y \neq 0$ is possible if

A. x=y

B. x= - y

C. 2x=y

D. none of these

Answer: A

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31. The given expression $\sec^2\theta = \frac{4xy}{(x+y)^2}$ is true if and only if :

A. $x + y \neq 0$

B. $x = y, x \neq 0$

C. x=y

D. $x \neq 0, y \neq 0$

Answer: C

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32. If $\sin x + \sin y = 3(\cos y - \cos x)$, then the value of $\sin 3x + \sin 3y$ is

A. 1

B. -1

C. 0

D. none of these

Answer: C

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33. If $A+B+C=\pi(A, B, C>0)$ and the angle C is obtuse, then

A. $\tan A \tan B>1$

B. $\tan A \tan B<1$

C. $\tan A \tan B=1$

D. none of these

Answer: B

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34. If $\sin(x+3\alpha)=3\sin(\alpha-x)$ then

A. $\tan x=\tan\alpha$

B. $\tan x=\tan^2\alpha$

C. $\tan x=\tan^3\alpha$

D. $\tan x=3\tan\alpha$

Answer: C

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35. If $0<x<1$, then $\sqrt{1+x^2}\left[\left\{x\cos\left(\cot^{-1}x\right)+\sin\left(\cot^{-1}x\right)\right\}^2-1\right]^{1/2}$ is equal to

A. $\dfrac{x}{\sqrt{1+x^2}}$

B. x

C. $x\sqrt{1+x^2}$

D. $\sqrt{1+x^2}$

Answer: C

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PROBLEM SET (2) TRUE AND FALSE

1. The inequality $2^{\sin^2\theta}+2^{\cos^2\theta}\geq 2\sqrt{2}$ holds for all real θ

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2. Show that the equation $\sin\theta = x+\frac{1}{x}$ is not possible if x is real.

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3. The inequality $2^{\sin\theta}+2^{\cos\theta}\geq 2^{1-\left(1/\sqrt{2}\right)}$ holds for all real values of θ

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4. $4^{\sin^2 x} + 4^{\cos^2 x} \geq 4$ for all real x.

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PROBLEM SET (3) (MULTIPLE CHOICE QUESTIONS)

1. The θ eliminate of the following equations is $x = a\cos^3\theta, y = b\sin^3\theta$

A. $\left(\frac{a}{x}\right)^{2/3} + \left(\frac{b}{y}\right)^{2/3} = 1$

B. $\left(\frac{b}{x}\right)^{2/3} + \left(\frac{a}{y}\right)^{2/3} = 1$

C. $\left(\frac{x}{a}\right)^{2/3} + \left(\frac{y}{b}\right)^{2/3} = 1$

D. $\left(\frac{x}{b}\right)^{2/3} + \left(\frac{y}{a}\right)^{2/3} = 1$

Answer: C

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2. If $x\sin^3\alpha + y\cos^3\alpha = \sin\alpha\cos\alpha$ and $x\sin\alpha = y\cos\alpha,$ then $x^2 + y^2 =$

A. 0

B. 1

C. 2

D. none

Answer: B

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3. If $\tan\theta + \sin\theta = 1,$ then $\cos^2\theta = n$ then$m^2 - n^2$ is equal

A. $m^2 - n^2 = 4mn$

B. $m^2 + n^2 = 4mn$

C. $m^2 - n^2 = m^2 + n^2$

D. $m^2 - n^2 = 4\sqrt{(mn)}$

Answer: D

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4. If $\cot\theta + \tan\theta = x and \sec\theta - \cos\theta = y,$ prove that $(x^2y)^{\frac{2}{3}} - (xy^2)^{2/3} = 1$

A. $(xy^2)^{2/3} - (x^2y)^{2/3} = 1$

B. $(x^2y)^{2/3} - (xy^2)^{2/3} = 1$

C. $x^{2/3} + y^{2/3} = 1$

D. $x^{2/3} - y^{2/3} = 1$

Answer: B

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5. If $\cos ec\theta - \sin\theta = a^3, \sec\theta - \cos\theta = b^3,$ Prove that : $a^2b^2(a^2 + b^2) = 1$

A. -1

B. 1

C. 2

D. none

Answer: B

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6. If $\sin A + \cos A = p, \sin^3 A + \cos^3 A = q,$ then

A. $p^3 - 3p + q = 0$

B. $q^3 - 3q + p = 0$

C. $p^3 - 3p + 2q = 0$

D. $q^3 - 3q + 2p = 0$

Answer: C

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7. If $x = \sec\theta - \tan\theta$, and $y = \cos ec\theta + \cot\theta$, then

A. $xy + 1 = x - y$

B. $xy + 1 = y - x$

C. $xy + 1 = x + y$

D. none of these

Answer: B

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8. $If: \frac{x}{a}\cos\theta + \frac{y}{b}s\int h\eta = 1an\frac{dx}{a}s\int h\eta - \frac{y}{b}\cos\theta = 1,$ Prove that : $\frac{x^2}{a^2} + \frac{y^2}{b^2} = 2$

A. $\frac{x^2}{a^2} + \frac{y^2}{b^2} = 0$

B. $\frac{x^2}{a^2} + \frac{y^2}{b^2} = 2$

C. $\frac{x^2}{a^2} + \frac{y^2}{b^2} = -1$

D. $\frac{x^2}{a^2} + \frac{y^2}{b^2} = 1$

Answer: B

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9. If $x = a\cos\theta + b\sin\theta$ and $y = a\sin\theta - b\cos\theta$. then$a^2 + b^2$ is equal to

A. $a^2 - b^2 = p^2 - q^2$

B. $a^2 + b^2 = p^2 + q^2$

C. $a + b = p + q$

D. $a - b = p - q$

Answer: B

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10. If $p\sec\theta - b\tan\theta = a$ and $q\sec\theta + a\tan\theta = b$, then

A. $a^2 + b^2 = p^2 + q^2$

B. $a^2 + p^2 = b^2 + q^2$

C. $a^2 + q^2 = b^2 + p^2$

D. none

Answer: A

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11. If $a + b\tan\theta = \sec\theta$ and $b - a\tan\theta = 3\sec\theta$, then $a^2 + b^2 =$

A. 16

B. 10

C. 8

D. 4

Answer: B

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12. For $0 < \phi \leq \frac{\pi}{2}$, if $x = \sum_{n=0}^{\infty} \cos^{2n} \phi$, $y = \sum_{n=0}^{\infty} \sin^{2n} \phi$, $z = \sum_{n=0}^{\infty} \cos^{2n} \phi \sin^{2n} \phi$, then

A. $xyz = xz + y$

B. $xyz = xy + z$

C. $xyz = x + y + z$

D. $xyz = yz + x$

Answer: B::C

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13. If $\tan x = \dfrac{2b}{a-c}, (a \neq c)$

$y = a\cos^2 x + 2b\sin x\cos x + c\sin^2 x$

$z = a\sin^2 x - 2b\sin x\cos x + c\cos^2 x$, then

A. y=z

B. $y + z = a + c$

C. $y - z = a - c$

D. $y - z = (a-c)^2 + 4b^2$

Answer: B::C

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14. If $\sin x + \cos x = \sqrt{2}\cos x$, then $\cos x - \sin x$ is equal to

A. $\sqrt{2}\cos x$

B. $\sqrt{2}\sin x$

C. $\sqrt{2}(\cos x + \sin x)$

D. none of these

Answer: B

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15. If θ is an acute angle and $\sin\frac{\theta}{2} = \sqrt{\frac{x-1}{2x}}$ then $\tan\theta$ is equal to

A. $\sqrt{\frac{x-1}{x+1}}$

B. $\frac{\sqrt{x-1}}{x+1}$

C. $\sqrt{x^2-1}$

D. $\sqrt{x^2+1}$

Answer: C

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16. If $a\cos\theta - b\sin\theta = c, \quad \text{then} a\sin\theta + b\cos\theta$ is equal to

A. $\pm\sqrt{(a^2+b^2-c^2)}$

B. $\pm\sqrt{(b^2+c^2-a^2)}$

C. $\pm\sqrt{(c^2+a^2-b^2)}$

D. none

Answer: A

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17. If $\sin A+\sin 2A=x$ and $\cos A+\cos 2A=y,$ then $(x^2+y^2)(x^2+y^2-3)=$

A. 2y

B. 2x

C. $x+y$

D. none

Answer: A

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18. It is given that $\cos(\theta - \alpha) = a, \cos(\theta - \beta) = b$

What is $\sin^2(\alpha - \beta) + 2ab\cos(\alpha - \beta)$ equal to ?

A. $a^2 + b^2$

B. $a^2 - b^2$

C. $b^2 - a^2$

D. $-a^2 - b^2$

Answer: A

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19. If $a\sin^2 x + b\cos^2 x = c, b\sin^2 y + a\cos^2 y = d$ and $a\tan x = b\tan y$ then the value of $\frac{(d-a)(c-a)}{(b-c)(b-d)} =$

A. $\frac{(b-c)(b-d)}{(a-d)(a-c)}$

B. $\frac{(a-d)(c-a)}{(b-c)(d-b)}$

C. $\frac{(d-a)(c-a)}{(b-c)(d-b)}$

D. $\frac{(b-c)(b-d)}{(c-a)(a-d)}$

Answer: C

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

A. $\tan^2 x=\frac{2}{3}$

B. $\frac{\sin^8 x}{8}+\frac{cos^8 x}{27}=\frac{1}{125}$

C. $\tan^2 x=\frac{1}{3}$

D. $\frac{\sin^8 x}{8}+\frac{\cos^8 x}{27}=\frac{2}{125}$

Answer: A::B::C::D

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21. If $\frac{x}{\cos\theta} = \frac{y}{\cos\left(\theta - \frac{2\pi}{2}\right)} = \frac{2}{\cos\left(\theta + \frac{2\pi}{3}\right)}, then x + y + z =$

A. 1

B. 0

C. -1

D. none of these

Answer: B

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22. If $x\sin\theta = y\sin\left(\theta + \frac{2\pi}{3}\right) = z\sin\left(\frac{\theta + 4\pi}{3}\right)$, then $\Sigma xy =$

A. 1

B. $1/2$

C. 0

D. none of these

Answer: C

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23. $\begin{vmatrix} \cos(\theta+A) & \sin(\theta+A) & 1 \\ \cos(\theta+B) & \sin(\theta+B) & 1 \\ \cos(\theta+C) & \sin(\theta+C) & 1 \end{vmatrix}$ is independent of

A. A

B. B

C. C

D. θ

Answer: D

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PROBLEM SET (3) (FILL IN THE BLANKS)

1. The maximum distance of a point on the graph of function $y = \sqrt{3}\sin x + \cos x$ from x -axis is .....

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2. The max. and min. values of $8\cos\theta - 15\sin\theta$ are ..... and .....

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PROBLEM SET (4) (MULTIPLE CHOICE QUESTIONS)

1. If $\tan\theta = -\frac{4}{3}$, then $\sin\theta$ is

A. $-4/5$ but not $4/5$

B. $-4/5$ or $4/5$

C. $4/5$ but not $-4/5$

D. none of these

Answer: B

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2. The value of $\tan 3A - \tan 2A - \tan A$ is equal to

A. tan 3A tan 2A tan A

B. $-$ tan 3A tan 2A tan A

C. tanA tan 2A - tan2A tan 3A - tan 3A tan A

D. none of these

Answer: A

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3. $\tan 5x - \tan 3x - \tan 2x =$

A. tan5x tan 3x tan 2x

B. cos 5x cos 3x cos 2x

C. sin 5x sin 3x sin 2x

D. tan 8x tan 3x tan 2x

Answer: A

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4. If $A + C = B$, then tan A tan B tan C = ?

A. tan A tan B $+$ tan C

B. tan B- tan C - tan A

C. tan A $+$ tan B - tan C

D. $-(\Sigma \tan A)$

Answer: B

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5. Prove than tan $56^\circ = \frac{\cos 11^\circ + \sin 11^\circ}{\cos 11^\circ = -\sin 11^\circ}$

A. $\tan 45^\circ$

B. $\tan 56^\circ$

C. $\tan 60^\circ$

D. $\cot 11^\circ$

Answer: B

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6. $\tan 54^\circ$ can be expressed as

A. $(\cos 9^\circ - \sin 9^\circ)/(\cos 9^\circ + \sin 9^\circ)$

B. $(\sin 9^\circ - \cos 9^\circ)/(\sin 9^\circ + \cos 9^\circ)$

C. $(\cos 9^\circ + \sin 9^\circ)/(\cos 9^\circ - \sin 9^\circ)$

D. $(\sin 9^\circ + \cos 9^\circ)/(\sin 9^\circ - \cos 9^\circ)$

Answer: C

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7. Prove that: $\sin^2\left(\frac{\pi}{8}+\frac{A}{2}\right)-\sin^2\left(\frac{\pi}{8}-\frac{A}{2}\right)=\frac{1}{\sqrt{2}}\sin A$

A. sin A

B. cos A

C. $\frac{1}{\sqrt{2}}\sin A$

D. $\frac{1}{\sqrt{2}}\cos A$

Answer: C

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8. $\tan 70^\circ - \tan 20^\circ =$

A. $\tan 50^\circ$

B. $\cot 50^\circ$

C. $2\tan 50^\circ$

D. $2\cot 50^\circ$

Answer: C

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9. $\tan 20^\circ + 2\tan 50^\circ - \tan 70^\circ =$

A. 1

B. 0

C. $\tan 50^\circ$

D. none

Answer: B

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10. $\cos 24^\circ + \cos 5^\circ + \cos 175^\circ + \cos 204^\circ + \cos 300^\circ =$

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

B. $-\frac{1}{2}$

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

D. 1

Answer: A

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11. $\cos 35^\circ + \cos 85^\circ + \cos 155^\circ =$

A. 0

B. $1/\sqrt{3}$

C. $1/\sqrt{2}$

D. $\cos 275^\circ$

Answer: A

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12. Find the value of $\cos 12^\circ + \cos 84^\circ + \cos 156^\circ + \cos 132^\circ$

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

B. 1

C. $-\frac{1}{2}$

D. $\frac{1}{8}$

Answer: C

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13. $\sin 78^\circ - \sin 66^\circ - \sin 42^\circ + \sin 6^\circ =$

A. -1

B. $-1/2$

C. $1/2$

D. 1

Answer: B

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14. $\cot 7\frac{1^\circ}{2} =$

A. $\sqrt{1}+\sqrt{2}+\sqrt{3}+\sqrt{4}$

B. $\sqrt{2}+\sqrt{3}+\sqrt{4}+\sqrt{5}$

C. $\sqrt{2}+\sqrt{3}+\sqrt{4}+\sqrt{6}$

D. $\sqrt{2}+\sqrt{3}+\sqrt{5}+\sqrt{6}$

Answer: C

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15. $\cot 22\frac{1^\circ}{2}$

A. $1+\frac{1}{\sqrt{2}}$

B. $1+\sqrt{2}$

C. $\sqrt{2}-1$

D. none

Answer: B

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16. If $\tan\theta = a/b$, then $b\cos 2\theta + a\sin 2\theta =$

A. a

B. b

C. b/a

D. none

Answer: B

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17. If $\sin\alpha = 12/13, (0 < \alpha < \pi/2)$ and $\cos\beta = -\frac{3}{5}\left(\pi < \beta < \frac{3}{2}\pi\right)$, the value of $\sin(\alpha + \beta)$ is

A. $-56/65$

B. $16/65$

C. $56/65$

D. $-16/65$

Answer: A

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18. If $\tan\theta = a - \frac{1}{4a}$, then $\sec\theta - \tan\theta =$

A. 2a

B. $-2a, \frac{1}{2a}$

C. $2a, -\frac{1}{2a}$

D. $2a, \frac{1}{2a}$

Answer: B

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19. If θ and ϕ are angles in the first quadrant such that $\tan\theta = 1/7$ and $\sin\phi = 1/\sqrt{10}$, then

A. $\theta + 2\phi = 90^\circ$

B. $\theta = 2\phi = 30^\circ$

C. $\theta + 2\phi = 75^\circ$

D. $\theta + 2\phi = 45^\circ$

Answer: D

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20. The vlaue of

$\tan 81^\circ - \tan 63^\circ - \tan 27^\circ + \tan 9^\circ$ is equal to

A. 2

B. 3

C. 4

D. none of these

Answer: C

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21. Find the angle θ whose cosine is equal to its tangent.

A. $\cos\theta = 2\cos 18^\circ$

B. $\cos\theta = 2\sin 18^\circ$

C. $\sin\theta = 2\sin 18^\circ$

D. $\sin\theta = 2\cos 18^\circ$

Answer: C

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22. Prove that: $tanA + \tan\left(60^0 + A\right) - tan\left(60^0 - A\right) = 3tan3A$

A. tan 3A

B. 2 tan 3A

C. 3 tan 3A

D. none

Answer: C

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23. If $\tan\alpha + \tan\left(\alpha + \frac{\pi}{3}\right) + \tan\left(\alpha + \frac{2\pi}{3}\right) = \lambda \tan 3\alpha$, then $\lambda =$

A. 1

B. 3

C. $\frac{1}{3}$

D. none

Answer: B

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24. Prove that :$\sin As \in \left(60^0 - A\right) s \in \left(60^0 + A\right) = \frac{1}{4}\sin 3A$

A. sin 3A

B. $\frac{1}{2}\sin 3A$

C. $\frac{1}{3}\sin 3A$

D. $\frac{1}{4}\sin 3A$

Answer: D

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25. If x is A.M. of $\tan\frac{\pi}{9}$ and $\tan\frac{5\pi}{18}$ and y is A.M. of $\tan\frac{\pi}{9}$ and $\tan\frac{7\pi}{18}$, then

A. $x > y$

B. $x = y$

C. $2x = y$

D. $x = 2y$

Answer: C

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26. The value of $\sin\frac{\pi}{10}\sin\frac{13\pi}{10}$ is

A. $1/2$

B. $-1/2$

C. $-1/4$

D. 1

Answer: C

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27. The value of $2\frac{\tan\pi}{10}+3\frac{\sec\pi}{10}-4\frac{\cos\pi}{10}$ is 0 b. 1 c. $\sqrt{5}$ d. none of these

A. 0

B. $\frac{10}{\sqrt{5}}$

C. 1

D. none

Answer: A

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28. The value of $\sin 50^\circ - \sin 70^\circ + \sin 10^\circ$ is equal to

A. 1

B. 0

C. $1/2$

D. 2

Answer: B

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29. The value of $\sqrt{3}\text{cosec}20^\circ - \sec 20^\circ$ is equal to

A. 2

B. $2\sin 20^\circ / \sin 40^\circ$

C. 4

D. $4\sin 20^\circ / \sin 40^\circ$

Answer: C

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30. Expression $\frac{1}{\cos 290^\circ} + \frac{1}{\sqrt{3}\sin 250^\circ}$ equals

A. $\frac{2}{\sqrt{3}}$

B. $\frac{4}{\sqrt{3}}$

C. $\frac{6}{\sqrt{3}}$

D. none

Answer: B

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31. The value of $\frac{1}{\sin 10^\circ} - \frac{\sqrt{3}}{\cos 10^\circ} =$

A. 1

B. 4

C. 2

D. 0

Answer: B

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32. The least value of $\cos^2\theta - 6\sin\theta\cos\theta + 3\sin^2\theta + 2$ is

A. $4 + \sqrt{10}$

B. $4 - \sqrt{10}$

C. 0

D. none

Answer: B

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33. If $\tan\alpha = \frac{m}{m+1} and tan\beta = \frac{1}{2m+1}$. Find the possible values of $(\alpha+\beta)$

A. $\pi/2$

B. $\pi/3$

C. $\pi/6$

D. $\pi/4$

Answer: D

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34. If $\tan A = \frac{1}{2}$ and $\tan B = \frac{1}{3}$, then $\tan(2A+B)$ is equal to

A. 1

B. 2

C. 3

D. 4

Answer: C

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35. $A = 18^\circ$ and cos 2A=

A. sin B

B. sin 2B

C. sin3B

D. none

Answer: B

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36. If $\cot(\alpha+\beta)=0$, then $\sin(\alpha+2\beta)$=

A. $-\sin\alpha$

B. $\sin\beta$

C. $\cos\alpha$

D. $\cos\beta$

Answer: D

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37. Prove that $\dfrac{\tan^2 2\theta-\tan^2\theta}{1-\tan^2 2\theta\tan^2\theta}=\tan 3\theta\tan\theta.$

A. $\tan 3\theta/\tan\theta$

B. $\cot 3\theta/\cot\theta$

C. $\tan 3\theta\tan\theta$

D. $\cot 3\theta \cot \theta$

Answer: C

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38. $\dfrac{\sec 8\theta - 1}{\sec 4\theta - 1} =$

A. $\tan 8\theta \tan 2\theta$

B. $\tan 8\theta / \tan 2\theta$

C. $\cot 8\theta \cot 2\theta$

D. none

Answer: B

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39. Prove that $(\cos\alpha + \cos\beta)^2 + (\sin\alpha + \sin\beta)^2 = 4\cos^2\left(\dfrac{\alpha - \beta}{2}\right)$.

A. $4\sin^2(\alpha-\beta)/2$

B. $4\cos^2(\alpha-\beta)/2$

C. $4\sin^2(\alpha+\beta)/2$

D. $4\cos^2(\alpha+\beta)/2$

Answer: B

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40. $(\cos\alpha-\cos\beta)^2+(\sin\alpha-\sin\beta)^2=$

A. $4\cos^2(\alpha+\beta)/2$

B. $4\sin^2(\alpha+\beta)/2$

C. $4\sin^2(\alpha-\beta)/2$

D. $4\cos^2(\alpha-\beta)/2$

Answer: C

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41. Prove that:

$$\left(\frac{\cos A+\cos B}{\sin A-s\in B}\right)^n+\left(\frac{\sin A+s\in B}{\cos A-\cos B}\right)^n=\left\{2\cot^n\left(\frac{A-B}{2}\right),\quad \text{if}\quad nise\right.$$

A. $2\tan^n\frac{A-B}{2}$

B. $2\cot^n\frac{A-B}{2}$

C. 0

D. none

Answer: B::C

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42. If $\cos(\alpha+\beta)=\frac{4}{5}$ and $\sin(\alpha-\beta)=\frac{5}{13}$ and α,β lie between 0° and 45°, find the value of $\tan 2\alpha$:

A. $\frac{25}{16}$

B. $\frac{56}{33}$

C. $\frac{19}{12}$

D. $\frac{20}{7}$

Answer: B

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43. Let α, 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 $\cos\frac{\alpha - \beta}{2}$ is

A. $-\frac{3}{\sqrt{130}}$

B. $\frac{3}{\sqrt{130}}$

C. $\frac{6}{65}$

D. $-\frac{6}{65}$

Answer: A

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44. The roots of both the equation $\sin^2 x + p\sin x + q = 0$ and $\cos^2 x + r\cos x + s = 0$ and α and β. Then the value of $\sin(\alpha + \beta) =$

A. $\dfrac{2qs}{q^2 + s^2}$

B. $\dfrac{2ps}{p^2 + s^2}$

C. $\dfrac{2pr}{p^2 + r^2}$

D. $\dfrac{2qr}{q^2 + r^2}$

Answer: C

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45. If `sin(120^0-alpha)=sin(120^0-beta),0

A. $\alpha = \beta$

B. $\alpha = \beta$ or $\alpha + \beta = \dfrac{\pi}{3}$

C. $\alpha + \beta = 0, \alpha + \beta = \dfrac{\pi}{3}$

D. none of these

Answer: B

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46. If $A = 130^\circ$ and $x = \sin A + \cos A$, then

A. $x > 0$

B. $x < 0$

C. $x = 0$

D. $x \leq 0$

Answer: A

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47. If $\alpha and \beta$ are the solutions of the equation $atan\theta + bsec\theta = c,$ then show that $\tan(\alpha + \beta) = \dfrac{2ac}{a^2 - c^2}$

A. $\frac{2ab}{a^2 - b^2}$

B. $\frac{2ab}{a^2 + b^2}$

C. $\frac{2ac}{a^2 - c^2}$

D. $\frac{2bc}{b^2 - c^2}$

Answer: C

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48. If a $\cos 2\theta + b \sin 2\theta = c$ has α and β as its solution, then the value of $\tan \alpha + \tan \beta$ is

A. $\frac{2a}{b + c}$

B. $\frac{2b}{c + a}$

C. $\frac{2c}{a + b}$

D. none

Answer: B

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49. and $\tan\alpha\tan\beta =$

A. $\dfrac{a-b}{a+b}$

B. $\dfrac{b-c}{b+c}$

C. $\dfrac{c-a}{c+a}$

D. none

Answer: C

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50. If α and β are two distinct solutions of the equation $a\cos x + b\sin x = c$ then $\cos^2\dfrac{\alpha-\beta}{32} =$

A. $\dfrac{a^2}{b^2+c^2}$

B. $\dfrac{b^2}{c^2+a^2}$

C. $\frac{c^2}{a^2+b^2}$

D. none

Answer: C

View Text Solution

51. If $\alpha+\beta=\frac{\pi}{2} and \beta+\gamma=\alpha,$ then $\tan\alpha$ equals $2(\tan\beta+\tan\gamma)$ (b) $\tan\beta+\tan\gamma$ $\tan\beta+2\tan\gamma$ (d) $2\tan\beta+\tan\gamma$

A. $2(\tan\beta+\tan\gamma)$

B. $\tan\beta+\tan\gamma$

C. $\tan\beta+2\tan\gamma$

D. $2\tan\beta+\tan\gamma$

Answer: C

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52. If $\tan\alpha = \frac{1}{7}, \tan\beta = \frac{1}{3}$, then $\cos 2\alpha =$

A. $\sin 2\beta$

B. $\sin 4\beta$

C. $\sin 3\beta$

D. None

Answer: B

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53. If $A = \sin 45^\circ + \cos 45^\circ$ and $B = \sin 44^\circ + \cos 44^\circ$ then

A. $A > B$

B. $A < B$

C. $A = B$

D. none of these

Answer: A

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54. If $\cos\theta = \dfrac{a\cos\phi + b}{a + b\cos\phi}$. Show that : $\tan.\dfrac{\theta}{2} = \pm\sqrt{\dfrac{a-b}{a+b}}\tan.\dfrac{\phi}{2}$.

A. $\sqrt{\left(\dfrac{a-b}{a+b}\right)}\tan\dfrac{\phi}{2}$

B. $\sqrt{\left(\dfrac{a+b}{a-b}\right)}\cos\dfrac{\phi}{2}$

C. $\sqrt{\left(\dfrac{a-b}{a-b}\right)}\sin\dfrac{\phi}{2}$

D. none

Answer: A

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55. If $\cos\theta = \dfrac{\cos\alpha - \cos\beta}{1 - \cos\alpha\cos\beta}$, then one of the values of $\tan\left(\dfrac{\theta}{2}\right)$ is

A. $\pm\tan(\alpha/2)\tan(\beta/2)$

B. $\pm\tan(\alpha/2)\cot(\beta/2)$

C. $\pm\tan(\beta/2)\cot(\alpha/2)$

D. none

Answer: B

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56. If $\tan\beta = \cos\theta\tan\alpha$, then $\tan^2\frac{\theta}{2}$=

A. $\frac{\sin(\alpha+\beta)}{\sin(\alpha-\beta)}$

B. $\frac{\cos(\alpha-\beta)}{\cos(\alpha+\beta)}$

C. $\frac{\sin(\alpha-\beta)}{\sin(\alpha+\beta)}$

D. $\frac{\cos(\alpha+\beta)}{\cos(\alpha-\beta)}$

Answer: C

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57. If $\tan^2\left(\frac{\pi}{4}+\frac{\theta}{2}\right)=-\frac{a}{b}$, then

A. $\sin\theta=\frac{a-b}{a+b}$

B. $\sin\theta=\frac{a+b}{a-b}$

C. $\cos\theta=\frac{a+b}{a-b}$

D. $\tan\theta=\frac{a-b}{a+b}$

Answer: B

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58. If $\tan(A+B)=3\tan A$, then $\frac{\sin 2(A+B)+\sin 2A}{\sin 2B}$ is equal to

A. $\frac{1}{3}$

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

C. 2

D. 3

Answer: C

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59. If $\cos 2B = \frac{\cos(A+C)}{\cos(A-C)}$, then tan A, tan B, tan C are in

A. A.P.

B. G.P.

C. H.P.

D. none

Answer: B

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60. If $\cot y = \frac{\sin x - \sin z}{\cos z - \cos x}$ then which of the following is possible?

A. A.P.

B. G.P.

C. H.P.

D. none

Answer: A

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61. If $\sin(y+z-x), \sin(z+x-y), \sin(x+y-z)$ be in A.P., prove that $\tan x \tan y, \tan z$ are also in A.P.

A. A.P.

B. G.P.

C. H.P.

D. none

Answer: A

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62. If $tan^2\theta = 2tan^2\varphi + 1$, prove that $\cos 2\theta + s \in^2 \varphi = 0.$

A. 1

B. 2

C. 0

D. -1

Answer: C

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63. If A and B are positive acute angles satisfying the equalities $3\cos^2 A + 2\cos^2 B = 4$ and $\frac{3\sin A}{\sin B} = \frac{2\cos B}{\cos A}$, then $A + 2B$ is equal to

A. $\pi/4$

B. $\pi/3$

C. $\pi/6$

D. $\pi/2$

Answer: D

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64. 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

A. $1/\cos\alpha$

B. $-2/\cos\alpha$

C. $2/\cos\alpha$

D. none of these

Answer: B

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65. If $\tan x = \frac{b}{a}$, then $\sqrt{\frac{a+b}{a-b}} + \sqrt{\frac{1-b}{a+b}}$ is equal to $2s \in x / \sqrt{\sin 2x}$ (b) $2\cos x / \sqrt{\cos 2x}$ $2\cos x / \sqrt{\sin 2x}$ (d) $2s \in x / \sqrt{\cos 2x}$

A. $2\sin x / \sqrt{\sin 2x}$

B. $2\cos x / \sqrt{\cos 2x}$

C. $2\cos x / \sqrt{\sin 2x}$

D. $2\sin x / \sqrt{\cos 2x}$

Answer: B

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66. If the angle A of a triangle ABC is given by the equation 5 cos A + 3 = 0, then sin A and tan A are the roots of the equation

A. $15x^2 - 8x - 16 = 0$

B. $15x^2 - 8\sqrt{2}x + 16 = 0$

C. $15x^2 - 8x + 16 = 0$

D. $15x^2 + 8x - 16 = 0$

Answer: D

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67. If ABCD, is a cycling quadrilateral such that $\tan A - 5 = 0$ and $5\cos B + 3 = 0$, then the quadratic equation whose roots are $\cos C$ and $\tan D$, is

A. $39x^2 + 88x + 48 = 0$

B. $39x^2 - 16x - 48 = 0$

C. $39x^2 - 88x + 48 = 0$

D. none

Answer: B

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68. If $\cos(A-B)=\frac{3}{5}$ and $\tan A\tan B=2,$ then

A. $\cos A\cos B=1/5$

B. $\sin A\sin B=-2/5$

C. $\cos(A+B)=-1/5$

D. $\sin A\cos B=4/5$

Answer: A::C

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

A. $\frac{p^2}{\left\{p^2+(1-q)^2\right\}}$

B. $\frac{p^2}{(p^2+q^2)}$

C. $\frac{q^2}{\left\{p^2-(1-q)^2\right\}}$

D. $\frac{p^2}{(p+q)^2}$

Answer: A

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70. The value of $\frac{3+\cot 76^\circ \cot 16^\circ}{\cot 76^\circ + \cot 16^\circ} =$

A. $\tan 16^\circ$

B. $\cot 76^\circ$

C. $\tan 46^\circ$

D. $\cot 44^\circ$

Answer: C:D

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71. $\frac{2\sec\theta + 3\tan\theta + 5\sin\theta - 7\cos\theta + 5}{2\tan\theta + 3\sec\theta + 5\cos\theta + 7\sin\theta + 8} =$

A. $\tan \frac{\theta}{2}$

B. $\cot \frac{\theta}{2}$

C. $\sec \frac{\theta}{2}$

D. $\cos ec \frac{\theta}{2}$

Answer: D

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72. The value of 16 sin $144^\circ \sin 108^\circ \sin 72^\circ \sin 36^\circ$ is equal to

A. 5

B. 4

C. 3

D. 1

Answer: A

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73. Find the value of:

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

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

B. $\cos\frac{\pi}{8}$

C. $\frac{1}{8}$

D. $\frac{1+\sqrt{2}}{2\sqrt{2}}$

Answer: C

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74. $\cos^4\frac{\pi}{8}+\cos^4\frac{3\pi}{8}+\cos^4\frac{5\pi}{8}+\cos^4\frac{7\pi}{8}=$

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

B. $\frac{2}{2}$

C. $\frac{3}{2}$

D. $\frac{4}{2}$

Answer: C

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75. The value of $\sqrt{3}\cot 20^\circ - 4\cos 20^\circ$ is

A. 1

B. -1

C. 0

D. none of these

Answer: A

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76. If

$Ifx\cos\alpha + y\sin\alpha = 2a, x\cos\beta + y\sin\beta = 2a \text{ and } 2\sin\frac{\alpha}{2}\sin\frac{\beta}{2} = 1,$

then

A. $\cos\alpha + \cos\beta = \frac{2ax}{x^2 + y^2}$

B. $\cos\alpha\cos\beta = \frac{2a^2 - y^2}{x^2 + y^2}$

C. $y^2 = 4a(a - x)$

D. $\cos\alpha + \cos\beta = 2\cos\alpha\cos\beta$

Answer: C

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77. If A+B=$\frac{\pi}{4}$, then (1+tan A) (1+tanB) is equal

A. 1

B. 2

C. $\sqrt{3}$

D. none of these

Answer: B

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78. If $f(x) = \frac{\cot x}{1 + \cot x}$ and $\theta + \phi = \frac{5\pi}{4}$, then the value of $f(\theta).\ f(\phi)$ is

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

B. $-\frac{1}{2}$

C. 2

D. -2

Answer: A

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79. If $\sin A + \sin B = a$ and $\cos A + \cos B = b$, then $\cos(A + B) =$

A. $\frac{a^2+b^2}{b^2-a^2}$

B. $\frac{2ab}{a^2+b^2}$

C. $\frac{b^2-a^2}{a^2+b^2}$

D. $\frac{a^2-b^2}{a^2+b^2}$

Answer: C

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80. If $\cos A + \cos B = a$, and $\sin A + \sin B = b$ where $a, b \neq 0$, then $\sin(A+B)$ is equal to

A. $\frac{ab}{a^2+b^2}$

B. $\frac{2ab}{a^2+b^2}$

C. $\frac{a^2+b^2}{2ab}$

D. $\frac{ab}{a+b}$

Answer: B

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81. Let $\cos(\alpha+\beta)=\frac{4}{5}$ and let $\sin(\alpha-\beta)=\frac{5}{13}$, where $0\leq\alpha,\beta=\frac{\pi}{4}$.

Then $\tan 2\alpha=$

A. $\frac{56}{33}$

B. $\frac{19}{12}$

C. $\frac{20}{7}$

D. $\frac{25}{16}$

Answer: A

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82. If $\tan\left(\frac{\theta}{2}\right)=\frac{5}{2}$ and $\tan\left(\frac{\phi}{2}\right)=\frac{3}{4}$, the value of $\cos(\theta+\phi)$, is

A. $-\frac{364}{725}$

B. $-\frac{627}{725}$

C. $-\frac{240}{339}$

D. none of these

Answer: B

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83. If $2\cos\theta = x + \frac{1}{x}$, $2\cos\phi = y + \frac{1}{y}$, then $\cos(\theta - \phi) =$

A. $\frac{x}{y} + \frac{y}{x}$

B. $xy + \frac{1}{xy}$

C. $\frac{1}{2}\left(\frac{x}{y} + \frac{y}{x}\right)$

D. none

Answer: C

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84. $\sin 12^\circ \sin 48^\circ \sin 54^\circ$ is equal to

A. $1/4$

B. $1/8$

C. $1/16$

D. none of these

Answer: B

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85. The value of $\sin \frac{\pi}{7} + \sin \frac{2\pi}{7} + \sin \frac{3\pi}{7}$ is

A. $\cot \frac{\pi}{14}$

B. $\frac{1}{2} \cot \frac{\pi}{14}$

C. $\tan \frac{\pi}{14}$

D. $\frac{1}{2} \tan \frac{\pi}{14}$

Answer: B

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86. $\cos\frac{2\pi}{7}+\cos\frac{4\pi}{7}+\cos\frac{6\pi}{7}$

A. 0

B. $-\frac{1}{2}$

C. 1

D. none

Answer: B

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87. $\cos 0+\cos\frac{\pi}{7}+\cos\frac{2\pi}{7}+\cos\frac{3\pi}{7}+\cos\frac{4\pi}{7}+\cos\frac{5\pi}{7}+\cos\frac{6\pi}{7}=$

A. 0

B. $-\frac{1}{2}$

C. 1

D. none

Answer: C

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88. The value of $\cos\frac{\pi}{11}+\cos\frac{3\pi}{11}+\cos\frac{5\pi}{11}+\cos\frac{7\pi}{11}+\cos\frac{9\pi}{11},$ is

A. 0

B. $-1/2$

C. $1/2$

D. none of these

Answer: C

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89. The average of $\sin 2^\circ, \sin 4^\circ, \sin 6^\circ, \ldots\ldots \sin 180^\circ$ is

A. $\frac{1}{90}\cos 1^\circ$

B. $\frac{1}{90}\sin 1^\circ$

C. $\frac{1}{90}\cot 1^\circ$

D. none

Answer: C

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90. Let $z = \cos\theta + i\sin\theta$. Then the value of $\sum_{m=1}^{15} Im\left(z^{2m-1}\right)$ at $\theta = 2^\circ$ is

A. $\frac{1}{\sin 2^\circ}$

B. $\frac{1}{3\sin 2^\circ}$

C. $\frac{1}{2\sin 2^\circ}$

D. $\frac{1}{4\sin 2^\circ}$

Answer: D

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91. $\sin\frac{\pi}{n}+\sin\frac{3\pi}{n}+\sin\frac{5\pi}{n}+\ldots.n$ terms =

A. 1

B. 0

C. $n/2$

D. none

Answer: B

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92. $\sum_{r=1}^{n-1}\sin^2\frac{r\pi}{n}$ equals

A. $\frac{n}{2}$

B. $\frac{n-2}{2}$

C. $\frac{n-1}{2}$

D. none

Answer: C

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93. Given that $\left(1+\sqrt{1+y}\right)\tan y = 1+\sqrt{1-y}$ Then $\sin 4y$ is equal to

A. 4y

B. 2y

C. y

D. none of these

Answer: C

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94. For a positive integer n, let $f_n(\theta) = \left(\tan\frac{\theta}{2}\right)(1+\sec\theta)(1+\sec 2\theta)(1+\sec 4\theta)....(1+\sec 2^n\theta)$

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. $f_5\left(\frac{\pi}{128}\right) = 1$

Answer: A::B::C::D

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95. If $0^\circ < \theta < 180^\circ$, then $\sqrt{2+\sqrt{2+\sqrt{...+\sqrt{2(1+\cos\theta)}}}} =$ (n number of 2's)

A. $2\cos\frac{\theta}{2^{n-1}}$

B. $2\cos\frac{\theta}{2^n}$

C. $2\cos\frac{\theta}{2^{n+1}}$

D. none

Answer: B

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96. The minimum value of $\tan B \tan C$ in an acute angled triangle ABC is

A. $\tan\frac{A}{2}$

B. $\cot\frac{A}{2}$

C. $\cos ec^2\frac{A}{2}$

D. $\cot^2\frac{A}{2}$

Answer: D

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97. If

$u = (1 + \cos\theta)(1 + \cos 2\theta) - \sin\theta . \sin 2\theta, v = \sin\theta(1 + \cos 2\theta) + \sin 2\theta(1$

, then $u^2 + v^2 =$

A. $4(1 + \cos\theta)(1 + \cos 2\theta)$

B. $4(1 + \sin\theta)(1 + \sin 2\theta)$

C. $4(1 - \cos\theta)(1 - \cos 2\theta)$

D. $4(1 - \sin\theta)(1 - \sin 2\theta)$

Answer: A

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98. If

$t_1 = (\tan x)^{\cot x}, t_2 = (\cot x)^{\cot x}, t_3 = (\tan x)^{\tan x}, t_4 = (\cot x)^{\tan x}, 0 < x$

, then :

A. $t_1 < t_2 < t_3 < t_4$

B. $t_2 > t_4 > t_3 > t_1$

C. $t_1 > t_4 > t_3 > t_2$

D. $t_1 > f_2 > t_3 > t_4$

Answer: B

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99. 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 maximum and minimum values of u^2 is given by

A. $2(a^2 + b^2)$

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

C. $(a + b)^2$

D. $(a - b)^2$

Answer: D

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100. If $\cos x + \cos y = a$, $\cos 2x + \cos 2y = b$, $\cos 3x + \cos 3y = c$, then

A. $\cos^2 x + \cos^2 y = 1 + \frac{b}{2}$

B. $\cos x \cos y = \frac{a^2}{2} - \left(\frac{b+2}{4}\right)$

C. $2a^3 + c = 3a(1+b)$

D. $a + b + c = 3abc$

Answer: A::B::C

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PROBLEM SET (4) TRUE AND FALSE

1. If θ lies in the third quadrant , then the expression $\sqrt{(4\sin^4\theta + \sin^2 2\theta)} + 4\cos^2\left(\frac{1}{4}\pi - \frac{1}{2}\theta\right)$ equals 2.

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2. If $a \tan\theta = b,$ then $a\cos 2\theta + b\sin 2\theta =$

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3. $2\cos x - \cos 3x - \cos 5x = 16\cos^3 x \sin^2 x$

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4. (i) $\cos 20^\circ + \cos 100^\circ + \cos 140^\circ = 0$

(ii) $\sin 50^\circ - \sin 70^\circ + \sin 10^\circ = 0$

(iii) $2\cos\frac{\pi}{13}\cos\frac{9\pi}{13} + \cos\frac{3\pi}{13} + \cos\frac{5\pi}{13} = 0$

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5. $m\cos(\theta+\alpha) = n\cos(\theta-\alpha)$, then $\frac{m+n}{m-n} = \frac{\cot\theta}{\cot\alpha}$

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PROBLEM SET (4) FILL IN THE BLANKS

1. If A, B, C, D are angles of a cyclic quadrilateral, then prove that

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

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2. If A,B,C,D be the angles of a cyclic quadrilateral, then

$\sin A + \sin B - \sin C - \sin D = \ldots\ldots\ldots\ldots$

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3. If $\sin x + \sin y = a$, $\cos x + \cos y = b$, then

$\sin(x + y) = \ldots\ldots\ldots\ldots$

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4. If $\sin x + \sin y = a, \cos x + \cos y = b,$ then what is the value of $\cos(x - y)$?

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5. If $\sin x + \sin y = a, \cos x + \cos y = b,$ then

$\tan \frac{x - y}{2} = \ldots\ldots\ldots\ldots$

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6. If α and β are the solution of $a \cos \theta + b \sin \theta = c,$ then

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7. If α and β are the solutions of a $\cos \theta + b \sin \theta = c,$ then

$\sin \alpha \sin \beta = \ldots\ldots\ldots\ldots$

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8. If α and β are the solutions of a $\cos\theta + b\sin\theta = c$, then

$\cos\alpha + \cos\beta = \ldots\ldots\ldots\ldots\ldots$

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9. If α and β are the solutions of a $\cos\theta + b\sin\theta = c$, then

$\cos\alpha\cos\beta = \ldots\ldots\ldots\ldots$

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10. In a triangle ABC in which $\angle C = 90^\circ$, the equation whose roots are tanA and tan B is $\ldots\ldots\ldots\ldots\ldots\ldots\ldots$

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PROBLEM SET (5) (MULTIPLE CHOICE QUESTIONS)

1. The value of $\cos\frac{\pi}{7}\cos\frac{2\pi}{7}\cos\frac{4\pi}{7}$ is

A. 0

B. $1/2$

C. $1/3$

D. $-1/8$

Answer: D

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2. The value of $\sin\frac{\pi}{14}\sin\frac{3\pi}{14}\sin\frac{5\pi}{14}$ is

A. $1/16$

B. $1/8$

C. $1/2$

D. 1

Answer: B

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3. The value of $\cos(\pi/5)\cos(2\pi/5)\cos(4\pi/5)\cos(8\pi/5)$ is

A. $1/16$

B. 0

C. $-1/8$

D. $-1/16$

Answer: D

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4. $\sin 20^\circ \sin 40^\circ \sin 60^\circ \sin 80^\circ = \dfrac{3}{16}$

A. $-3/16$

B. $5/16$

C. $3/16$

D. $-1/16$

Answer: C

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5. The value of $\cos 20^\circ \cos 40^\circ \cos 60^\circ \cos 80^\circ$ is equal to

A. $1/4$

B. $1/8$

C. $1/16$

D. none

Answer: C

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6. $\tan 20^\circ \quad \tan 40^\circ \quad \tan 60^\circ \quad \tan 80^\circ =$

A. $\sqrt{3}$

B. 3

C. $3\sqrt{3}$

D. none

Answer: B

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7. $\frac{\cos^6 \pi}{9} - 33\frac{\tan^4 \pi}{9} + 27\frac{\tan^2 \pi}{9}$ is equal to 0 (b) $\sqrt{3}$ (c) 3 (d) 9

A. 0

B. $\sqrt{3}$

C. 3

D. 6

Answer: C

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8. Prove that$\sin\frac{\pi}{14}\sin\frac{3\pi}{14}\sin\frac{5\pi}{14}\sin\frac{7\pi}{14} = \frac{1}{8}$

A. $1/2$

B. $1/4$

C. $1/8$

D. $1/16$

Answer: C

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9. The value of $\sin\frac{\pi}{14}.\sin\frac{3\pi}{14}.\sin\frac{5\pi}{14}.\sin\frac{7\pi}{14}.\sin\frac{9\pi}{14}.\sin\frac{11\pi}{14}.\sin\frac{13\pi}{14}$ is

A. $1/4$

B. $1/8$

C. $1/16$

D. $1/64$

Answer: D

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10. $\sin 12^\circ \sin 48^\circ \sin 54^\circ$ is equal to

A. $\frac{1}{4}$

B. $\frac{1}{8}$

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

D. none

Answer: B

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11. $\sin 6^\circ \sin 42^\circ \sin 66^\circ \sin 78^\circ =$

A. $1/4$

B. $1/8$

C. $1/16$

D. $1/64$

Answer: C

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12. Prove that $\cos 6^\circ \cos 42^\circ \cos 66^\circ \cos 78^\circ = \frac{1}{16}$

A. $1/4$

B. $1/8$

C. $1/16$

D. $1/64$

Answer: C

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

A. $5/16$

B. $3/16$

C. $1/16$

D. none

Answer: A

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14. $\cos \frac{\pi}{65} \cos \frac{2\pi}{65} \cos \frac{4\pi}{65} \cos \frac{8\pi}{65} \cos \frac{16\pi}{65} \cos \frac{32\pi}{65} =$

A. $1/8$

B. $1/16$

C. $1/32$

D. $1/64$

Answer: D

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15. If $A = \tan 6^\circ \tan 42^\circ$ and $B = \cot 66^\circ \cot 78^\circ$ then-

A. A=2B

B. $A = \frac{1}{B}$

C. $A = B$

D. $3A = 2B$

Answer: C

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16. The value of $\tan 6^\circ \tan 42^\circ \tan 66^\circ \tan 78^\circ$ is

A. 1

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

C. $\frac{1}{4}$

D. $\frac{1}{8}$

Answer: A

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17. $\cos 60^\circ \cos 36^\circ \cos 42^\circ \cos 78^\circ$ is

A. $1/8$

B. 1

C. $1/16$

D. none of these

Answer: C

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18. Value of $\sin 47^\circ + \sin 61^\circ - \sin 11^\circ - \sin 25^\circ$ is

A. $\sin 7^\circ$

B. $\cos 7^\circ$

C. $\sin 36^\circ$

D. $\cos 36^\circ$

Answer: B

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19. The value of $\sin \frac{\pi}{18} \sin \frac{5\pi}{18} \sin \frac{7\pi}{18}$ is

A. $1/2$

B. $1/4$

C. $1/8$

D. $1/16$

Answer: C

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20. $\cos\frac{2\pi}{15}\cos\frac{4\pi}{15}\cos\frac{8\pi}{15}\cos\frac{16\pi}{15}=\frac{1}{16}$

A. 1

B. $1/2$

C. $1/4$

D. $1/16$

Answer: D

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21. The value of $\cos\frac{\pi}{15}\cos\frac{2\pi}{15}\cos\frac{3\pi}{15}\cos\frac{4\pi}{15}\cos\frac{5\pi}{15}\cos\frac{6\pi}{15}\cos\frac{7\pi}{15}$ is

A. $1/2^6$

B. $1/2^7$

C. $1/2^8$

D. none of these

Answer: B

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22. The value of $\cos\frac{\pi}{7}\cos\frac{2\pi}{7}\cos\frac{3\pi}{7}$ is

A. $1/8$

B. $-1/8$

C. 1

D. 0

Answer: A

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23. The value of $\cos\frac{\pi}{9}\cos\frac{2\pi}{9}\cos\frac{3\pi}{9}\cos\frac{4\pi}{9}$, is

A. $1/8$

B. $1/16$

C. $1/64$

D. none of these

Answer: B

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24. If $P_{n+1} = \sqrt{\frac{1}{2}(1+p_n)}$, then $\cos\left(\frac{\sqrt{1+p_0^2}}{p_1 p_2 p_3 \ldots \text{to } \infty}\right)$ is equal to

A. 1

B. -1

C. p_0

D. $1/p_0$

Answer: C

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

A. 1

B. 0

C. $1/2$

D. none

Answer: A

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26. If $\frac{\sin^4\alpha}{a}+\frac{\cos^4\alpha}{b}=\frac{1}{a+b}$, show that $\frac{\sin^8\alpha}{a^3}+\frac{\cos^8\alpha}{b^3}=\frac{1}{(a+b)^3}$

A. $\frac{1}{(a+b)^3}$

B. $\frac{a}{b^2}$

C. $\frac{a}{b-a}$

D. $\frac{b}{b-a}$

Answer: A

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PROBLEM SET (6) (MULTIPLE CHOICE QUESTIONS)

1. If $A + B + C = \pi$, then, find

$\tan A + \tan B + B + \tan C$

A. 1

B. $\tan A \tan B + \tan B \tan C + \tan C \tan A$

C. $\tan A \tan B \tan C$

D. none of these

Answer: C

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2. If $A + B + C = 180^\circ$, then $\sin 2A + \sin 2B + \sin 2C = ?$

A. 4 sin A sin B sin C

B. 4 cos A cos B cos C

C. 2 sinA sin B sin C

D. 8 sin A sin B sin C

Answer: A

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3. If $A+B+C=\pi$, prove that :

$$\sin(B+C-A)+\sin(C+A-B)+\sin(A+B-C)=4\sin A\sin B\sin$$

A. 4 sin A sin B sin C

B. 4 cos A cos B cos C

C. 4 sin A cos B cos C

D. 4 cos A sin B sin C

Answer: A

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4. $$\frac{\cos A}{\sin B\sin C}+\frac{\cos B}{\sin C\sin A}+\frac{\cos C}{\sin A\sin B}=2$$

A. 1

B. 2

C. 4

D. none

Answer: B

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5. If $\sin^{-1} a + \sin^{-1} b + \sin^{-1} c = \pi,$ then the value of $a\sqrt{(1-a^2)} + b\sqrt{(1-b^2)} + \sqrt{(1-c^2)}$ will be $2abc$ (b) abc (c) $\frac{1}{2}abc$ (d) $\frac{1}{3}abc$

A. $a+b+c$

B. $a^2b^2c^2$

C. 2abc

D. 4abc

Answer: C

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6. If $A+B+C=\pi$, then $\cos 2A+\cos 2B+\cos 2C=$

A. $1+4\cos A\cos B\sin C$

B. $-1+4\sin A\sin B\cos C$

C. $-1-4\cos A\cos B\cos C$

D. none of these

Answer: C

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7. If $A+B+C=\frac{3\pi}{2}$, then $\cos 2A+\cos 2B+\cos 2C=\ ?$

A. $1-4\cos A\cos B\cos C$

B. $4\sin A\sin B\sin C$

C. $1-2\cos A\cos B\cos C$

D. $1-4\sin A\sin B\sin C$

Answer: D

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8. If $A+B=\frac{\pi}{3}$ and $\cos A+\cos B=1$, then which of the following are true :

A. $\cos(A-B)=\frac{1}{3}$

B. $\cos(A-B)=-\frac{1}{3}$

C. $|\cos A-\cos B|=\sqrt{2/3}$

D. $|\cos A-\cos B|=\frac{1}{\sqrt{3}}$

Answer: B::C

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9. In triangle ABC, $\frac{\sin A+\sin B+\sin C}{\sin A+\sin B-\sin C}$ is equal to $\frac{\tan A}{2}\frac{\cot B}{2}$ (b) $\frac{\cot A}{2}\frac{\tan B}{2}$ $\frac{\cot A}{2}\frac{\cot B}{2}$ (d) $\frac{\tan A}{2}\frac{\tan B}{2}$

A. $\tan\frac{A}{2}\cot\frac{B}{2}$

B. $\cot\frac{A}{2}\tan\frac{B}{2}$

C. $\cot\frac{A}{2}\cot\frac{B}{2}$

D. $\tan\frac{A}{2}\tan\frac{B}{2}$

Answer: C

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10. If $A+B+C=\pi$, prove that : $\frac{\sin 2A+\sin 2B+\sin 2C}{\sin A+\sin B+\sin C}=8\sin,\frac{A}{2}\sin,\frac{B}{2}\sin,\frac{C}{2}$

A. $8\sin\frac{A}{2}\sin\frac{B}{2}\sin\frac{C}{2}$

B. $8\cos\frac{A}{2}\cos\frac{B}{2}\cos\frac{C}{2}$

C. $8\tan\frac{A}{2}\tan\frac{B}{2}\tan\frac{C}{2}$

D. $8\cot\frac{A}{2}\cot\frac{B}{2}\cot\frac{C}{2}$

Answer: A

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11. $\frac{\sin 2A+\sin 2B+\sin 2C}{\cos A+\cos B+\cos C-1}=8\cos,\frac{A}{2}\cos,\frac{B}{2}\cos,\frac{C}{2}$

A. $8\sin(A/2)\sin(B/2)\sin(C/2)$

B. $8\cos(A/2)\cos(B/2)\cos(C/2)$

C. $8\sin(A/2)\cos(B/2)\cos(C/2)$

D. $8\cos(A/2)\sin(B/2)\sin(C/2)$

Answer: B

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12. if $A+B+C=\pi$ then $\sin^2 A+\sin^2 B-\sin^2 C=$

A. 2 sin A sin B sin C

B. 2cos A cos B cosC

C. 2cos A sin B sin C

D. 2 sin A sin B cos C

Answer: D

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13. if A+B+C = π then $\sin^2\frac{A}{2}+\sin^2\frac{B}{2}+\sin^2\frac{C}{2}=$

A. $1-2\cos\frac{A}{2}\cos\frac{B}{2}\cos\frac{C}{2}$

B. $1-2\sin\frac{A}{2}\sin\frac{B}{2}\sin\frac{C}{2}$

C. $1+\cos\frac{A}{2}\cos\frac{B}{2}\cos\frac{C}{2}$

D. $1+\sin\frac{A}{2}\sin\frac{B}{2}\sin\frac{C}{2}$

Answer: B

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14. If $A+B+C=180^\circ$, then prove that $\frac{\cos^2(A)}{2}+\frac{\cos^2(B)}{2}+\frac{\cos^2(C)}{2}=2\left(1+\frac{\sin(A)}{2}\frac{\sin(B)}{2}\frac{\sin(C)}{2}\right)$

A. $1+2\sin\frac{A}{2}\sin\frac{B}{2}\sin\frac{C}{2}$

B. $2+2\sin\frac{A}{2}\sin\frac{B}{2}\sin\frac{C}{2}$

C. $1+2\cos\frac{A}{2}\cos\frac{B}{2}\cos\frac{C}{2}$

D. $2+2\cos\frac{A}{2}\cos\frac{B}{2}\cos\frac{C}{2}$

Answer: B

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15. If $\alpha+\beta+\gamma,\pi,$ then the value of $\sin^2\alpha+\sin^2\beta-\sin^2\gamma$is equal to

A. $2\sin\alpha\sin\beta\sin\gamma$

B. $2\sin\alpha\sin\beta\cos\gamma$

C. $2\cos\alpha\cos\beta\sin\gamma$

D. $2\cos\alpha\cos\beta\cos\gamma$

Answer: B

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16. If $\alpha+\beta+\gamma=2\pi$, prove that : $\cos^2\alpha+\cos^2\beta+\cos^2\gamma-2\cos\alpha\cos\beta\cos\gamma=1.$

A. $1+2\sin\alpha\sin\beta\sin\gamma$

B. $1+2\cos\alpha\cos\beta\cos\gamma$

C. $1-\sin\alpha\sin\beta\cos\gamma$

D. $1-\cos\alpha\cos\beta\cos\gamma$

Answer: B

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17. In any triangle ABC, if $(\sin A + \sin B + \sin C)(\sin A + \sin B - \sin C) = 3\sin A \sin B$, then

A. $A = 60^\circ$

B. $B = 60^\circ$

C. $C = 60^\circ$

D. none

Answer: C

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18. If A,B,C are the angles of a triangle, then $\sin^2 A + \sin^2 B + \sin^2 C - 2\cos A \cos B \cos C =$

A. 1

B. 2

C. 3

D. 4

Answer: B

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19. $\cos^2 A + \cos^2 B + \cos^2 C =$

A. $1 - 2\sin A \sin B \sin C$

B. $1 - 2\cos A \cos B \cos C$

C. $1 + \sin A \sin B \sin C$

D. $1 + \cos A \cos B \cos C$

Answer: B

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20. $\sin^2 A + \sin^2 B + \sin^2 C =$

A. $2 + 2\cos A \cos B \cos C$

B. $2 + 2\sin A \sin B \sin C$

C. $1 + 2\cos A \cos B \cos C$

D. $1 - 2\sin A \sin B \sin C$

Answer: B

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21. If $A + B + C = \pi$, prove that : `sin^2, A/2 + sin^2, B/2 -sin^2, C/2 =1-2 cos, A/2 cos, B/2 sin, C/2

A. $1 - 2\cos\frac{A}{2}\cos\frac{B}{2}\sin\frac{C}{2}$

B. $1 - 2\cos\frac{B}{2}\cos\frac{C}{2}\sin\frac{A}{2}$

C. $1 - 2\cos\frac{C}{2}\cos\frac{A}{2}\sin\frac{B}{2}$

D. none

Answer: A

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22. If : $\cos^2 A + \cos^2 B + \cos^2 C = 1, \text{then}: \Delta ABC$ is

A. equilateral

B. isosceles

C. right angles

D. none

Answer: C

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23. In a $!ABC$ if sin A cos B = $\frac{1}{4}$ and 3 tan A = B , then the triangle is

A. right angled

B. equilateral

C. isosceles

D. none of these

Answer: A

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24. If any $\triangle ABC, \tan A + \tan B + \tan C = 6$ and $\tan A \tan B = 2$, then the values of tanA, tanB and tanC are respectively` (A) 1,2,3 (B) 3,2,1 (C) 2,1,3 (D) 1,2,0

A. 1,2,3

B. 2,1,3

C. 1,2,0

D. none

Answer: A::B

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25. If in a triangle ABC, $\tan A + \tan B + \tan C$ has the value 6, then the value of cot A cot B cot C is

A. $1/6$

B. 1

C. 6

D. none

Answer: A

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26. In a triangle ABC if $\tan A : \tan B : \tan C = 3 : 4 : 5$ then the value of sin A sin B sin C is

A. $\frac{2}{\sqrt{5}}$

B. $\frac{2\sqrt{5}}{3}$

C. $\frac{2\sqrt{5}}{9}$

D. $\frac{2}{3\sqrt{5}}$

Answer: B

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27. If $A+B+C=\pi,$ prove that $\frac{\tan^2 A}{2}+\frac{\tan^2 B}{2}+\frac{\tan^2 C}{2}\geq 1.$

A. ≤ 1

B. ≥ 1

C. $=0$

D. $=1$

Answer: B

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28. If $A+B+C=\pi$ and A, B, C are acute positive angles and cotA cotB cotC = k, then

A. $k \leq \frac{1}{3\sqrt{3}}$

B. $k \geq \frac{1}{3\sqrt{3}}$

C. $k < \frac{1}{9}$

D. $k > \frac{1}{3}$

Answer: A

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29. In a ΔABC, the value of $\cot\frac{A}{2}\cot\frac{B}{2}\cos\frac{C}{2} is$

A. $k \leq 3$

B. $k \leq 3\sqrt{3}$

C. $k \geq 3\sqrt{3}$

D. none

Answer: C

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30. " If $\alpha = \frac{2\pi}{7}$,then the value of $\tan\alpha\tan 2\alpha + \tan 2\alpha\tan 4\alpha + \tan 4\alpha\tan\alpha$ is "

A. -5

B. -3

C. -1

D. -7

Answer: D

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31. If $x + y + z = \pi/2$, then $\tan y\tan z + \tan z\tan x + \tan x\tan y =$

A. 1

B. tan x tan y tan z

C. cot x cot y cot z

D. none

Answer: A

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32. If $x + y + z = \pi/2$, then$\cot x + \cot y + \cot z =$

A. tan x tan y tan z

B. cot x cot y cot z

C. 1

D. ∞

Answer: B

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33. In a triangle ABC, $\sum \cot A \cot B =$

A. 1

B. -1

C. 0

D. none

Answer: A

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34. If A,B,C be the angles of a triangle, then $\sum \frac{\cot A + \cot B}{\tan A + \tan B} =$

A. 1

B. -1

C. 0

D. none

Answer: A

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35. Consider a triangle ABC such that $\cot A + \cot B + \cot C = \cot \theta$.

Now answer the following :

Q. $\sin(A-\theta)\sin(B-\theta)\sin(C-\theta) = :$

A. $\sin^3 \theta$

B. $\cos^3 \theta$

C. $\tan^3 \theta$

D. $\cot^3 \theta$

Answer: A

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36. In a triangle ABC, if

$\cot A + \cot B + \cot C = \cot \theta$, then

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

A. $\tan^2 \theta$

B. $\cot^2 \theta$

C. $\cot \theta$

D. $\tan \theta$

Answer: D

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37. In a triangle ABC, if

$\cot A + \cot B + \cot C = \cot \theta$, then

The possible value of θ is

A. 45°

B. 35°

C. 30°

D. 15°

Answer: C

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38. If $\Sigma xy = 1$, then $\Sigma \frac{x+y}{1-xy} =$

A. $\frac{1}{xyz}$

B. $\frac{4}{xyz}$

C. xyz

D. none

Answer: A

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39. In a triangle ABC, if the angles are in the ratio $1:2:4$, then $\frac{\sum \sec^2 A}{\sum \cos ec^2 A} = ...$

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40. tan A, tan B , tan C are the roots of the cubic equation $x^3 - 7x^2 + 11x - 7 = 0$ then $A + B + C =$

A. $\frac{\pi}{2}$

B. π

C. 0

D. none

Answer: B

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41. In a triangle if sin A sin B sin C =p and cos A cos B cos C =q then tan A, tan B, tan C are the roots of the equation

A. $qx^3 + px^2 - (1+q)x + p = 0$

B. $qx^3 - px^2 + (1+q)x - p = 0$

C. $qx^3 - (1+p)x^2 + qx - p = 0$

D. $qx^3 - (1+p)x^2 + (1+q)x - p = 0$

Answer: B

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PROBLEM SET (6) TRUE AND FALSE

1. If $xy + yz + zx = 1$, then

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

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2. If $xy + yz + zx = 1$, then

$$\frac{x}{1+x^2} + \frac{y}{1+y^2} + \frac{z}{1+z^2} = \frac{1}{[(1+x^2)(1+y^2)(1+z^2)]^{1/2}}$$

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3. If $x + y + z = xyz$ prove that

$$\frac{2x}{1-x^2} + \frac{2y}{1-y^2} + \frac{2z}{1-z^2} = \frac{2x}{1-x^2}\frac{2y}{1-y^2}\frac{2z}{1-z^2}.$$

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4. If $x + y + z = xyz$, then

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

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5.

$$\tan(B - C) + \tan(C - A) + \tan(A - B) = \tan(B - C)\tan(C - A)\tan($$

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6. If $A+B+C=180^\circ$, then

$$\frac{\tan A+\tan B+\tan C}{\tan A\tan B\tan C}=?$$

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7. If $A+B+C=0$ and sin A =x,cos B =y, then $\cos^2 C=x^2+2xy\sin C+y^2$

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8. Prove that a triangle ABC is equilateral if and only if $\tan A+\tan B+\tan C=3\sqrt{3}$.

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PROBLEM SET (6) FILL IN THE BLANKS

1.

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

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MISCELLANEOUS EXERCISE (MATCHING EXNTRIES)

1. Match the entries of List -A and List-B.

	List-A		List-B
(a)	If $x\sin\theta = y\sin\left(\theta+\frac{2\pi}{3}\right) = z\sin\left(\theta+\frac{4\pi}{3}\right)$, then $\Sigma xy =$	1.	1/2
(b)	$\cos^4\frac{\pi}{8}+\cos^4\frac{3\pi}{8}+\cos^4\frac{5\pi}{8}+\cos^4\frac{7\pi}{8}=$	2.	$\frac{1}{64}$
(c)	$\cos\frac{\pi}{11}+\cos\frac{3\pi}{11}+\cos\frac{5\pi}{11}+\cos\frac{7\pi}{11}+\cos\frac{9\pi}{11}=$	3.	1
(d)	$\cos\frac{\pi}{65}\cos\frac{2\pi}{65}\cos\frac{4\pi}{65}\cos\frac{8\pi}{65}\cos\frac{16\pi}{65}\cos\frac{32\pi}{65}=$	4.	0
(e)	If $\theta=\frac{\pi}{2^n+1}$, then $2^n\cos\theta\cos 2\theta\cos 2^2\theta\ldots\cos 2^{n-1}\theta=$	5.	3/2

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2.

List-A	List-B
(a) $\sin\frac{\pi}{10}\sin\frac{3\pi}{10}=$	1. 1
(b) $\cot 7\frac{1^\circ}{2}=$	2. $-\frac{1}{4}$
(c) $\sin^2 40^\circ+\cos^2 140^\circ$	3. 3/4
(d) $\cos^2\frac{3\pi}{5}+\cos^2\frac{4\pi}{5}$	4. $\sqrt{2}+\sqrt{3}+\sqrt{4}+\sqrt{6}$

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3.

List-A	List-B
If A, B, C be the angles of a triangle, then	
(a) $\sin(B+C-A)+\sin(C+A-B)+\sin(A+B-C)=$	1. $1-2\cos\frac{A}{2}\cos\frac{B}{2}\sin\frac{C}{2}$
(b) $\sin^2\frac{A}{2}+\sin^2\frac{B}{2}-\sin^2\frac{C}{2}=$	2. 1
(c) If $\tan^2\frac{A}{2}+\tan^2\frac{B}{2}+\tan^2\frac{C}{2}=k$ then $k\geq$	3. $4\sin A\sin B\sin C$

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4.

Column-I	Column-II
(a) $\tan\frac{A+B}{2}$	(p) $\frac{2ab}{a^2+b^2}$
(b) $\cos(A+B)$	(q) b/a
(c) $\cos(A-B)$	(r) $\frac{a^2-b^2}{a^2+b^2}$
(d) $\sin(A+B)$	(s) $\frac{a^2+b^2-2}{2}$

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5. Match the following Column I to Column II

Column-I	Column-II
(a) $\cos 2\theta = \sin 3\theta$	(p) $22\frac{1}{2}^\circ$
(b) $\cos 3\theta = \sin 7\theta$	(q) 30°
(c) $\tan\theta = \cot 3\theta$	(r) 9°
(d) $\cot\theta = \tan 2\theta$	(s) 18°

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6. Given $\frac{\sin\alpha}{a} = \frac{\cos\alpha}{b} = \frac{\tan\alpha}{c} = k$

Column-I	Column-II
(a) $a^2 + b^2$	(p) $\frac{1}{b^2 k^4}$
(b) $a^2 + b^2 + c^2$	(q) $\frac{1}{k^2}$
(c) bc	(r) $\frac{1}{ak}$
(d) $\frac{1}{ck} + \frac{ak}{1+bk}$	(s) $\frac{a}{k}$

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MISCELLANEOUS EXERCISE (COMPREHENSION)

1. If $y = \frac{\sqrt{1-\sin 4\theta}+1}{\sqrt{1+\sin 4\theta}-1}$ then one of the values of y is

A. $\cot\theta$

B. $-\tan\theta$

C. $\tan\left(\frac{\pi}{4}+\theta\right)$

D. $-\cot\left(\frac{\pi}{4}+\theta\right)$

Answer: A:B::C:D

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2. For $0<\phi\leq\frac{\pi}{2}$, if $x=\sum_{n=0}^{\infty}\cos^{2n}\phi, y=\sum_{n=0}^{\infty}\sin^{2n}\phi, z=\sum_{n=0}^{\infty}\cos^{2n}\phi\sin^{2n}\phi$, then

A. xyz =xy + y

B. $xyz=xy+z$

C. $xyz=x+y+z$

D. $xy^2=y^2+x$

Answer: A::B

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3. If $\cos(A-B)+\cos(B-C)+\cos(C-A)=-\frac{3}{2}$ then

A. $\sum \cos A = 0$

B. $\sum \sin A = 0$

C. $\sum (\cos A + \sin A) = 0$

D. $\sum \cos A \sin A = 0$

Answer: A::B::C

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4. For a $+$ ive integer , let $f_n(\theta) = \tan\frac{\theta}{2}(1+\sec\theta)(1+\sec 2\theta)\ldots\ldots(1+\sec 2^n\theta)$ 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. $f_5\left(\frac{\pi}{128}\right) = 1$

Answer: A::B::C::D

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MISCELLANEOUS EXERCISE (SELF ASSESSMENT TEST)

1. The value of $\cos 10^\circ - \sin 10^\circ$ is

A. positive

B. negative

C. 0

D. 1

Answer: A

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2. The value of cos $1^\circ \cos 2^\circ \cos 3^\circ$ .....cos 179° is

A. $1/\sqrt{2}$

B. 0

C. 1

D. none of these

Answer: B

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3. If $\sin x + \cos ecx = 2$, then $\sin^{3n} x + \cos ec^{3n} x$ equals

A. 2^{2n-1}

B. 2^{2n}

C. 2^{3n+1}

D. 2

Answer: D

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4. Which of the following is correct ?

A. $\sin 1^\circ > \sin 1$

B. $\sin 1^\circ < \sin 1$

C. $\sin 1^\circ = \sin 1$

D. $\sin 1^\circ = \frac{\pi}{180} \sin 1$

Answer: B

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5. If $\tan\theta = -\frac{4}{3}$, then $\sin\theta$ is

A. $-4/5$ but not $4/5$

B. $-4/5$ or $4/5$

C. $4/5$ but not $-4/5$

D. none of these

Answer: B

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6. Which of the following number (s) is/are rational?

A. $\sin 15^\circ$

B. $\cos 15^\circ$

C. $\sin 15^\circ \cos 15^\circ$

D. $\sin 15^\circ \cos 75^\circ$

Answer: C

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7. $\tan 75^\circ - \cot 75^\circ =$

A. $2\sqrt{3}$

B. $2 + \sqrt{3}$

C. $2 - \sqrt{3}$

D. none of these

Answer: A

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8. The value of $\tan 3A - \tan 2A - \tan A$ is equal to

A. tan 3A tan 2A tan A

B. $-\tan 3A \tan 2A \tan A$

C. tan A tan 2A- tan 2A tan 3A- tan 3A tan A

D. none of these

Answer: A

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9. Prove than $\tan 56^\circ = \frac{\cos 11^\circ + \sin 11^\circ}{\cos 11^\circ = -\sin 11^\circ}$

A. $\tan 45^\circ$

B. $\tan 56^\circ$

C. $\tan 60^\circ$

D. $\cot 11^\circ$

Answer: B

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10. $\tan 54^\circ$ can be expressed as

A. $(\cos 9^\circ - \sin 9^\circ)/(\cos 9^\circ + \sin 9^\circ)$

B. $(\sin 9^\circ - \cos 9^\circ)/(\sin 9^\circ + \cos 9^\circ)$

C. $(\cos 9^\circ + \sin 9^\circ)/(\cos 9^\circ - \sin 9^\circ)$

D. $(\sin 9^\circ + \cos 9^\circ)/(\sin 9^\circ - \cos 9^\circ)$

Answer: C

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11. If $4n\alpha = \pi$ then the value of $\tan\alpha \tan 2\alpha \tan 3\alpha \ldots\ldots\ldots\ldots \tan(2n-1)\alpha =$

A. 1

B. 0

C. -1

D. none

Answer: A

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12. The value of $\sin(45^\circ + \theta) - \cos(45^\circ - \theta)$ is

A. $2\cos\theta$

B. $2\sin\theta$

C. 1

D. 0

Answer: D

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13. If $\sin\theta = \frac{-4}{5}$ and θ lies in third quadrant, then the value of $\cos\frac{\theta}{2}$ is

A. $1/5$

B. $-1/\sqrt{10}$

C. $-1/\sqrt{5}$

D. $1/\sqrt{10}$

Answer: C

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14. If $\tan\theta = 3$ and θ lies in thrid quadrant, then the value of $\sin\theta$ is

A. $1/\sqrt{10}$

B. $-1/\sqrt{10}$

C. $-3/\sqrt{10}$

D. $3/\sqrt{10}$

Answer: C

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15. If $\sin\alpha = 12/13, (0 < \alpha < \pi/2)$ and $\cos\beta = -\frac{3}{5}\left(\pi < \beta < \frac{3}{2}\pi\right)$

, the value of $\sin(\alpha + \beta)$ is

A. $-56/65$

B. $16/65$

C. $56/65$

D. $-16/65$

Answer: A

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16. If θ and ϕ are angles in the first quadrant such that $\tan\theta = 1/7$ and $\sin\phi = 1/\sqrt{10}$, then

A. $\theta + 2\phi = 90^\circ$

B. $\theta = 2\phi = 30^\circ$

C. $\theta + 2\phi = 75^\circ$

D. $\theta + 2\phi = 45^\circ$

Answer: D

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17. The value of $\cos(\pi/5)\cos(2\pi/5)\cos(4\pi/5)\cos(8\pi/5)$ is

A. $1/16$

B. 0

C. $-1/8$

D. $-1/16$

Answer: D

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18. $\sin 20^\circ \sin 40^\circ \sin 60^\circ \sin 80^\circ = \frac{3}{16}$

A. $-3/16$

B. $5/16$

C. $3/16$

D. $-5/16$

Answer: C

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19. The value of $\sqrt{3}\cos ec20^\circ - \sec 20^\circ$ is equal to:

A. 2

B. $2\sin 20^\circ / \sin 40^\circ$

C. 4

D. $4\sin 20^\circ / \sin 40^\circ$

Answer: C

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20. 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

A. $1/\cos\alpha$

B. $-2/\cos\alpha$

C. $2/\cos\alpha$

D. none of these

Answer: B

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21. If $\tan\alpha = \frac{b}{a}, a > b > 0$ and if $0 < \alpha < \frac{\pi}{4}$, then $\sqrt{\frac{a+b}{a-b}} + \sqrt{\frac{a-b}{a+b}}$ is equal to :

A. $2\sin x/\sqrt{\sin 2x}$

B. $2\cos x / \sqrt{\cos 2x}$

C. $2\cos x / \sqrt{\sin 2x}$

D. $2\sin x / \sqrt{\cos 2x}$

Answer: B

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22. If $\cos(A-B) = \frac{3}{5}$ and $\tan A \tan B = 2,$ then

A. $\cos A \cos B = 1/5$

B. $\sin A \sin B = -2/5$

C. $\cos(A+B) = -1/5$

D. $\sin A \cos B = 4/5$

Answer: A::C

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23. If $A + B = \frac{\pi}{3}$ and $\cos A + \cos B = 1$, then which of the following are true :

A. $\cos(A - B) = \frac{1}{3}$

B. $\cos(A - B) = -\frac{1}{3}$

C. $|\cos A - \cos B| = \sqrt{2/3}$

D. $|\cos A - \cos B| = \frac{1}{\sqrt{3}}$

Answer: B::C

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24. If $\Sigma n^2 = \lambda \Sigma n$, then $\sin^{-1}\left(\frac{9\lambda^2 - 4n^2}{6\lambda + 4n}\right)$ =

A. $\frac{\pi}{6}$

B. $\frac{\pi}{3}$

C. $\frac{\pi}{2}$

D. π

Answer: A

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25. If $A = 580^\circ$ then

A. $\sin \frac{1}{2}A = \frac{1}{2}\left[\sqrt{(1+\sin A)} - \sqrt{(1-\sin A)}\right]$

B. $\sin \frac{1}{2}A = -\left[\sqrt{(1+\sin A)} - \sqrt{(1-\sin A)}\right]$

C. $\sin \frac{1}{2}A = \frac{1}{2}\left[-\sqrt{(1+\sin A)} - \sqrt{(1-\sin A)}\right]$

D. $\cos \frac{1}{2}A = \sqrt{(1+\sin A)} - \sqrt{(1-\cos A)}$

Answer: C

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26. If $2\cos(A/2) = \sqrt{(1+\sin A)} - \sqrt{(1-\sin A)}$, then

A. $n\pi + (\pi/4) < A/2 < n\pi + (3\pi/4)$

B. $n\pi - (\pi/4) < A/2 < 2n\pi - (3\pi/4)$

C. $2n\pi - (3\pi/4) < A/2 < 2n\pi + (5\pi/4)$

D. $2n\pi + (\pi/4) < A/2 < 2n\pi + (3\pi/4)$

Answer: D

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27. If $\cos(\alpha+\beta) = \frac{4}{5}, \sin(\alpha-\beta) = \frac{5}{13}$ and α, β between 0 and $\frac{\pi}{4}, then \tan 2\alpha =$

A. $\frac{16}{63}$

B. $\frac{56}{63}$

C. $\frac{28}{33}$

D. none of these

Answer: B

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28. If a ΔPQR if $3\sin P + 4\cos Q = 6$ and $4\sin Q + 3\cos P = 1$, then $\angle R$ is equal to

A. $\frac{5\pi}{6}$

B. $\frac{\pi}{6}$

C. $\frac{\pi}{4}$

D. $\frac{3\pi}{4}$

Answer: B

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29. 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) $\frac{\sin^8 x}{8} + \frac{\cos^8 x}{27} = \frac{2}{125}$

A. $\tan^2 x = \frac{2}{3}$

B. $\frac{\sin^8 x}{8} + \frac{\cos^8 x}{27} = \frac{1}{125}$

C. $\tan^2 x = \frac{1}{3}$

D. $\frac{\sin^8 x}{8} + \frac{\cos^8 x}{27} = \frac{2}{125}$

Answer: A::B

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30. Let $\theta, \phi \in [0, 2\pi]$ be such that $2\cos\theta(1 - \sin\phi) = \sin^2\theta\left(\tan\frac{\theta}{2} + \cot\frac{\theta}{2}\right)\cos\phi - 1, \tan(2\pi - \theta) > 0$ and $-1 < \sin\theta < \frac{\sqrt{3}}{2}$, then ϕ cannot satisfy

A. $0 < \phi < \frac{\pi}{2}$

B. $\frac{\pi}{2} < \phi < \frac{4\pi}{3}$

C. $\frac{4\pi}{3} < \phi < \frac{3\pi}{2}$

D. $\frac{3\pi}{2} < \phi < 2\pi$

Answer: A::C::D

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31. The maximum value of the expression $\frac{1}{\sin^2\theta + 3\sin\theta\cos\theta + 5\cos^2\theta}$ is.....

A. 2

B. 3

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

D. $\frac{1}{3}$

Answer: A

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32. The expression $\frac{\tan A}{1-\cot A} + \frac{\cot A}{1-\tan A}$ can be written as :

A. $\sin A\cos A + 1$

B. $\sec A\cos ecA + 1$

C. $\tan A + \cot A$

D. $\sec A + \cos ecA$

Answer: B

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33. ABCD is a trapezium such that AB and CD are parallel and $BC \perp CD$.

If $\angle ADB = \theta$, $BC = p$ and $CD = q$, then AB is equal to

A. $\dfrac{(p^2 + q^2)\sin\theta}{p\cos\theta + q\sin\theta}$

B. $\dfrac{p^2 + q^2\cos\theta}{p\cos\theta + q\sin\theta}$

C. $\dfrac{p^2 + q^2}{p^2\cos\theta + q^2\sin\theta}$

D. $\dfrac{(p^2 + q^2)\sin\theta}{(p\cos\theta + q\sin\theta)^2}$

Answer: A

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MISCELLANEOUS EXERCISE (TRUE AND FALSE)

1. The equality $\sin A + \sin 2A + \sin 3A = 3$ holds for some real value of A.

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2. If $\theta = 160^\circ$, then $\sin\theta + \cos > 0$.

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3. $\cos 11^\circ - \cos 2^\circ$ is positive.

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4. The value of $\cos(-1044^\circ)$ is $\left(\sqrt{5}+1\right)/4$.

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5. If $\cos 2B = \frac{\cos(A+C)}{\cos(A-C)}$, then tan A, tan B, tan C are in

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6. The inequality $2^{\sin\theta} + 2^{\cos\theta} \geq 2^{1-\left(1/\sqrt{2}\right)}$ holds for all real values of θ

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MISCELLANEOUS EXERCISE (FILL IN THE BLANKS)

1. The maximum distance of a point on the graph of function $y = \sqrt{3}\sin x + \cos x$ from x -axis is . . . . . .

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2. If $\theta + \phi = \pi/4$, then the value of $(1 + \tan\theta)/(1 + \tan\phi)$ is

.....

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3. The larger of $\cos(\ln\theta) and \ln(\cos\theta)$ if `e^(-pi/2)

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4. If $y = 4\sin^2\theta - \cos 2\theta$, then y lies in the interval

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5. The real roots of the equation $\cos^7 x + \sin^4 x = 1$ in the interval $(-\pi, \pi)$ are _____, _____, and _____

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6. 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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