MATHS

BOOKS - DISHA PUBLICATION MATHS (HINGLISH)

TRIGONOMETRIC FUNCTIONS

Jee Main 5 Years At A Glance

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1. If the sum of all the solutions of the equation $8\cos x. \left(\cos\left(\frac{\pi}{6} + x\right)\cos\left(\frac{\pi}{6} - x\right) - \frac{1}{2}\right) = 1$ in $[0, \pi]$ is $k\pi$ then k is equal to

A. $\dfrac{13}{9}$

B. $\dfrac{8}{9}$

C. $\dfrac{20}{9}$

D. $\dfrac{2}{3}$

Answer: A

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2. PQR is a triangular park with $PQ = PR = 200m$. A.T.V. tower stands at the mid-point of QR. If the angles of elevation of the top of the tower at P, Q and R are respectively 45°, 30° and 30° then the height of the tower (in m) is

A. 50

B. $100\sqrt{3}$

C. $50\sqrt{2}$

D. 100

Answer: D

3. A man on the top of a vertical tower observes a car moving at a uniform speed coming directly towards it. If it takes 12 minutes for the angle of depression to change from $30^0 \rightarrow 45^0$, how soon after this will the car reach the tower? Give your answer to the nearest second.

A. $9\left(1 + \sqrt{3}\right)$

B. $\dfrac{9}{2}\left(\sqrt{3} - 1\right)$

C. $18\left(1 + \sqrt{3}\right)$

D. $19\left(\sqrt{3} - 1\right)$

Answer: A

4. $5\left(\tan^2 x - \cos^2 x\right) = 2\cos 2x + 9$, then the value of cos4x is:

A. $-\dfrac{7}{9}$

B. $-\dfrac{3}{5}$

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

D. $\dfrac{2}{9}$

Answer: A

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5. Let a vertical tower AB have its end A on the level ground. Let C be the mid-point of AB and P be a point on the ground such that AP = 2AB. If $\sqrt{BPC} = \beta$, then $\tan \beta$ is equal to

A. $\dfrac{4}{9}$

B. $\dfrac{6}{7}$

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

D. $\dfrac{2}{9}$

Answer: D

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6. If $0 \le x \le 2\pi$, then the number of real values of x, which satisfy the equation $\cos x + \cos 2x + \cos 3x + \cos 4x = 0$, is

A. 7

B. 9

C. 3

D. 5

Answer: A

7. A man is walking towards a vertical pillar in a straight path, at a uniform speed. At a certain point A on the path, he observes that the angle of elevation of the top of the pillar is 30^0 . After walking for 10 minutes from A in the same direction, at a point B, he observes that the angle of elevation of the top of the pillar is 60^0 . Then the time taken (in minutes) by him, from B to reach the pillar, is : (1) 6 (2) 10 (3) 20 (4) 5

A. 20

B. 5

C. 6

D. 10

Answer: B

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8. If m and M are the minimum and the maximum values of

$4 + \dfrac{1}{2}\sin^2 2x - 2\cos^4 x$, $x \in R$ then

A. $\dfrac{9}{4}$

B. $\dfrac{15}{4}$

C. $\dfrac{7}{4}$

D. $\dfrac{1}{4}$

Answer: B

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9. The number of $x \in [0, 2\pi]$ for which

$\left| \sqrt{2\sin^4 x + 18\cos^2 x} - \sqrt{2\cos^4 x + 18\sin^2 x} \right| = 1$, is

A. 2

B. 6

C. 4

D. 8

Answer: D

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10. If the angles of elevation of the top of tower from three collinear points A, B and C, on a line leading to the foot of the tower, are $30°$, $45°$ and $60°$ respectively, then the ratio , $AB : BC$ is

A. $1 : \sqrt{3}$

B. $2 : 3$

C. $\sqrt{3} : 1$

D. $\sqrt{3} : \sqrt{2}$

Answer: C

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11. In a $\triangle ABC \dfrac{a}{b} = 2 + \sqrt{2}$ and $\angle C = 60°$ Then the ordered pair $(\angle A, \angle B)$ is equal to :

A. $(45°, 75°)$

B. $(105°, 15°)$

C. $(15°, 105°)$

D. $(75°, 45°)$

Answer: B

12. Let $f_k = \dfrac{1}{k}\left(\sin^k x + \cos^k x\right)$, where $x \in \mathbb{R}$ and $k > 1$ then $f_4(x) - f_6(x)$ equals -

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

B. $\dfrac{1}{12}$

C. $\dfrac{1}{6}$

D. $\dfrac{1}{3}$

Answer: B

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13. A bird is sitting on the top of a vertical pole 20 m high and its elevation from a point O on the ground is $45°$. It flies off horizontally straight away from the point O. After one second, the elevation of the bird from O is reduced to $30°$. Then the speed (in m/s) of the bird is

A. $20\sqrt{2}$

B. $20\left(\sqrt{3}-1\right)$

C. $40\left(\sqrt{2}-1\right)$

D. $40\left(\sqrt{3}-\sqrt{2}\right)$

Answer: B

14. If $\cos ec\theta = \dfrac{p+q}{p-q}$ $(pq > 0, p \neq q)$, then $\left| \cot\left(\dfrac{\pi}{4} + \dfrac{\theta}{2}\right) \right|$ is equal to

A. $\sqrt{\dfrac{p}{q}}$

B. $\sqrt{\dfrac{q}{p}}$

C. $\sqrt{pq}$

D. pq

Answer: B

15. The number of values of α in $[0, 2\pi]$ for which $2\sin^3\alpha - 7\sin^2\alpha + 7\sin\alpha = 2$, is:

A. 6

B. 4

C. 3

D. 1

Answer: C

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Exercise 1

1. The range of the function $f(x) = \dfrac{1}{2 - \sin 3x}$ is

A. $(-2\,\infty\,,\,)$

B. $[-2, 3]$

C. $\left(\dfrac{1}{3}, 1\right)$

D. $\left(\dfrac{1}{2}, 1\right)$

Answer: B

2. Radian measure of $40° \, 20'$ is equal to

A. $\dfrac{120\pi}{504}$ radian

B. $\dfrac{121\pi}{540}$ radian

C. $\dfrac{121\pi}{3}$ radian

D. None of these

Answer: B

3. Show that the equation $\sec^2 \theta = \dfrac{4xy}{(x+y)^2}$ is only possible when

x=y

A. $x = y$

B. $x > y$

C. $x < y$

D. None of these

Answer: A

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4. if $\sin^2 \theta = \dfrac{x^2 + y^2 + 1}{2x}$ then x must be

A. -3

B. -2

C. 1

D. None of these

Answer: D

5. Find the angle in radian through which a pendulum swings if its length is 75cm and the tip describes an arc of length: 21cm

A. $\dfrac{7}{25}$

B. $\dfrac{6}{25}$

C. $\dfrac{8}{25}$

D. $\dfrac{3}{25}$

Answer: A

6. Which among the following is/are true ?

I. The values of cosec x repeat after an interval of 2π.

II. The values of sec x repeat after an interval of 2π.

III. The values of cot x repeat after an interval of π.

    A. I is true

    B. II is true

    C. III is true

    D. All are true

Answer: D

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7. The minute hand of a watch is 1.5 cm long. How far does its tip move in 40 minutes? (Use $\pi = 3.14$).

A. $2.68 cm$

B. $2.28 cm$

C. $6.82 cm$

D. $7.42 cm$

Answer: B

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8. if $0 \leq x \leq \pi$ and $81^{\sin^2 x} + 81^{\cos^2 x} = 30$ then $x =$

A. $\pi/6$

B. $\pi/2$

C. $\pi/4$

D. $3\pi/4$

Answer: A

9. The range of the function $f(x) = \dfrac{1}{2 - \sin 3x}$ is

A. $\left(\dfrac{1}{3}, 2\right)$

B. $\left(\dfrac{1}{3}, 1\right)$

C. $\left(\dfrac{1}{2}, 1\right)$

D. None of these

Answer: B

10. The range of $f(x) \cos \dfrac{\pi[x]}{2}$ is

A. $\{0, 1\}$

B. $\{-1, 1\}$

C. $\{-1, 0, 1\}$

D. $[-1, 1]$

Answer: C

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11. If $\dfrac{\cos A}{3} = \dfrac{\cos B}{3} = \dfrac{1}{5}$, $-\dfrac{\pi}{2} < A < 0$ and $-\dfrac{\pi}{2} < B < 0$
then the value of $2\sin A + 4\sin B$ is

A. 4

B. 2

C. 3

D. 0

Answer: A

12. If $\tan \theta + \sec \theta = p$, then what is the value of $\sec \theta$?

A. $\dfrac{p^2 + 1}{p^2}$

B. $\dfrac{p^2 + 1}{\sqrt{p}}$

C. $\dfrac{p^2 + 1}{2p}$

D. $\dfrac{p + 1}{2p}$

Answer: C

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13. If $\sin q + \cos ecq = 2$, then the vlaue of $\sin^6 q + \cos ec^6 q$ is equal to

A. 0

B. 1

C. 2

D. 2^3

14. Find the radius of the circle in which a central angle of $60°$ intercepts an arc of length 37.4 cm (use $\pi = \dfrac{22}{7}$)

A. $37.5 cm$

B. $32.8 cm$

C. $35.7 cm$

D. 34.5cm`

15. If $\cos\theta = -\dfrac{3}{5}$ and $\pi < \theta < 3\dfrac{\pi}{2}$, find the value of

$$\dfrac{\sec\theta - \tan\theta}{\cos ec\theta + \cot\theta}$$

A. 2

B. 4

C. 5

D. 6

Answer: D

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16. The range of $f(x) = \cos x - \sin x$ is

A. $\{-1, 1\}$

B. $[-1, 01]$

C. $[-\sqrt{2}, \sqrt{2}]$

D. $[-2, -2]$

Answer: C

17. If $\sin x + \cos x = \dfrac{1}{5}$, then tan 2x is

A. $\dfrac{25}{17}$

B. $\dfrac{7}{25}$

C. $\dfrac{25}{7}$

D. $\dfrac{24}{7}$

Answer: D

18. The least values of $(\sin^2\theta + \cos ec^2\theta)$ is

A. 1

B. 2

C. 3

D. 4

Answer: B

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19. The maximum value of $\left[\sin\left(x + \dfrac{\pi}{6}\right) + \cos\left(x + \dfrac{\pi}{6}\right)\right]$ in the interval $\left[0, \dfrac{\pi}{2}\right]$ is attained at x=

A. $\dfrac{\pi}{6}$

B. $\dfrac{\pi}{121}$

C. $\dfrac{\pi}{3}$

D. $\dfrac{\pi}{4}$

Answer: B

20. The expression

$$\dfrac{\cos 6x + 6\cos 4x + 15\cos 2x + 10}{\cos 5x + 5\cos 3x + 10\cos x}$$

A. $\cos 2x$

B. $2\cos x$

C. $\cos^2 x$

D. $1 + \cos x$.

Answer: B

21. Which of the following functions has period 2π ?

A. $y = \sin\left(2\pi t + \dfrac{\pi}{3}\right) + 2\sin\left(3\pi t + \dfrac{\pi}{4}\right) + \sin 5\pi t$

B. $y = \sin\dfrac{\pi}{3}t + \sin\dfrac{\pi}{4}t$

C. $y = \sin t + \cos 2t$

D. None of these

Answer: C

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22. The value of $\cot 5°.\cot 10°.\cot 15°\ldots\ldots\cot 85°$ is

A. 0

B. -1

C. 1

D. 2

Answer: C

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23. Write the value of $\tan\left(\dfrac{19\pi}{3}\right)$

   A. 1

   B. 2

   C. 3

   D. 5

Answer: C

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24. $\dfrac{1 + \sin A - \cos A}{1 + \sin A + \cos A} =$

A. $\sin \dfrac{A}{2}$

B. $\cos \dfrac{A}{2}$

C. $\tan \dfrac{A}{2}$

D. $\cot \dfrac{A}{2}$

Answer: C

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

A. $\tan 3A$

B. $2\tan 3A$

C. $3\tan 3A$

D. None of these

Answer: C

26. If $\dfrac{\sin(x+y)}{\sin(x-y)} = \dfrac{a+b}{a-b}$, then $\dfrac{\tan x}{\tan y}$ is equal to

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

B. $\dfrac{a}{b}$

C. ab

D. None of these

Answer: B

27. If $\tan A = \dfrac{1}{2}$ and $\tan B = \dfrac{1}{3}$, then: A+B=

A. π

B. $\dfrac{\pi}{6}$

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

D. $\dfrac{\pi}{4}$

Answer: D

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28. Find the value of $\sin\left(\dfrac{31\pi}{3}\right)$.

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

B. $-\dfrac{\sqrt{3}}{2}$

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

D. $\dfrac{1}{\sqrt{2}}$

Answer: A

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29. $\dfrac{1}{4}\left[\sqrt{3}\cos 23^\circ - \sin 23^\circ\right] =$

A. $\cos 43^\circ$

B. $\cos 7^\circ$

C. $\cos 53^\circ$

D. None of these

Answer: D

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30. $If \tan^2 \theta = 1 - e^2,$ then $\sec \theta + \tan^3 \theta \cos ec\theta =$

A. $\left(1 - e^2\right)^{3/2}$

B. $\left(2 - e^2\right)^{1/2}$

C. $\left(2 - e^2\right)^{3/2}$

D. None of these

Answer: C

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31. The value of $\sin 765° \, is \dfrac{1}{\sqrt{n}}$. Value of n is

A. 2

B. 3

C. 4

D. 0

Answer: A

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32. $\dfrac{\cot(-15\pi)}{4}$

A. $\dfrac{-1}{\sqrt{3}}$

B. 1

C. $\sqrt{3}$

D. $-\sqrt{3}$

Answer: B

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

A. $\dfrac{5}{4}$

B. $\dfrac{9}{4}$

C. $\dfrac{13}{4}$

D. 2

Answer: C

34. If $\sec\theta = x + \dfrac{1}{4x}$, then $\tan\theta + \sec\theta$ is equal to

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

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

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

D. $\dfrac{5}{4}$

Answer: A

35. If θ is an angle given by $\cos\theta = \dfrac{\cos^2\alpha + \cos^2\beta + \cos^2\gamma}{\sin^2\alpha + \sin^2\beta + \sin^2\gamma}$ where α, β, γ are the equal angles made by line with the positive directions

of the axes, then the measure of θ is

A. $\dfrac{\pi}{3}$

B. $\dfrac{\pi}{6}$

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

D. $\dfrac{\pi}{4}$

Answer: A

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36. If α and β be between 0 and $\dfrac{\pi}{2}$ and if $\cos(\alpha + \beta) = \dfrac{12}{13}$ and $\sin(\alpha - \beta) = \dfrac{3}{5}$, then $\sin 2\alpha$ is equal to

A. $\dfrac{55}{56}$

B. $\dfrac{13}{58}$

C. 0

D. $\dfrac{56}{65}$

Answer: D

37. The value of

$$\left(1 + \cos\left(\dfrac{\pi}{6}\right)\right)\left(1 + \cos\left(\dfrac{\pi}{3}\right)\right)\left(1 + \cos\left(\dfrac{2\pi}{3}\right)\right)\left(1 + \cos\left(\dfrac{7\pi}{6}\right)\right) =$$

A. 1

B. 2

C. 3

D. 8

Answer: C

38. Period of $\dfrac{\sin\theta + \sin 2\theta}{\cos\theta + \cos 2\theta}$ is

A. 2π

B. π

C. $\dfrac{2\pi}{3}$

D. $\dfrac{\pi}{3}$

Answer: C

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39. Prove : $2\left(\sin^6\theta + \cos^6\theta\right) - 3\left(\sin^4\theta + \cos^4\theta\right) + 1 = 0.$

A. 2

B. 0

C. 4

D. 6

Answer: B

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40. The value of tan 3 A - 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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41. Value of $\sin 47° + \sin 61° - \sin 11° - \sin 25°$ is

A. $\cos 7°$

B. $\sin 7°$

C. $\sin 61°$

D. $-\sin 25°$

Answer: A

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42. $f(x) = \left(\sin x^7\right)e^{x^5}.\ Sgn\left(x^9\right)$ is:

A. an even function

B. an odd function

C. neither even nor odd

D. None of these

Answer: B

43. The value of $\dfrac{\cot 54°}{\tan 36°} + \dfrac{\tan 20°}{\cot 70°}$ is

A. 2

B. 3

C. 1

D. 0

Answer: A

44. If $n = \dfrac{\pi}{4\alpha}$, then $\tan \alpha \tan 2\alpha \tan 3\alpha$....... . $\tan(2n - 1)\alpha$ is equal to

A. 1

B. -1

C. ∞

D. None of these

Answer: A

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45. Value of $2\sin^2\dfrac{\pi}{6} + \cos ec^2\dfrac{7\pi}{6} \cdot \cos^2\dfrac{\pi}{3} is \dfrac{m}{m-1}$. The value of 'm' is

A. 3

B. 2

C. 4

D. None of these

Answer: A

46. If $\cos 7\theta = \cos \theta - \sin 4\theta$, then the general value of θ is

A. $\dfrac{n\pi}{4}, \dfrac{n\pi}{3} + \dfrac{\pi}{18}$

B. $\dfrac{n\pi}{3}, \dfrac{n\pi}{3} + (-1)^n \dfrac{\pi}{18}$

C. $\dfrac{n\pi}{4}, \dfrac{n\pi}{3} + (-1)^n \dfrac{\pi}{18}$

D. $\dfrac{n\pi}{6}, \dfrac{n\pi}{3} + (-1)^n \dfrac{\pi}{18}$

Answer: C

47. General solution of $\tan 5\theta =$

A. $\theta = \dfrac{n\pi}{7} + \dfrac{\pi}{14}$

B. $\theta = \dfrac{n\pi}{7} + \dfrac{\pi}{5}$

C. $\theta = \dfrac{n\pi}{7} + \dfrac{\pi}{2}$

D. $\theta = \dfrac{n\pi}{7} + \dfrac{\pi}{3}$

Answer: A

48. If $\cos\theta + \cos 2\theta + \cos 3\theta = 0$

then the general value of θ is

A. $\theta = 2m\pi \pm 2\pi/3$

B. $\theta = 2m\pi \pm \pi/4$

C. $\theta = m\pi + (-1)^n 2\pi/3$

D. $\theta = m\pi + (-1)^n \pi/3$

Answer: A

49. Domain of the function $f(x) = \sqrt{\dfrac{1}{\sin x} - 1}$ is

A. $\bigcup_{n \in I} \left(2n\pi, 2n\pi + \dfrac{\pi}{2}\right)$

B. $\bigcup_{n \in I} \left(2n\pi, (2n + 1)\pi\right)$

C. $\bigcup_{n \in I} \left[(12n - 1)\pi, 2n\pi\right]$

D. None of these

Answer: B

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50. The solution of $\tan^2 9x = \cos 2x - 1$ is

A. $\dfrac{n\pi}{3}, n \in I$

B. $\dfrac{n\pi}{6}, n \in I$

C. $n\pi, n \in I$

D. None of these

Answer: D

51. The number of points of intersection of the two curves $y = 2 \sin x$ and $y = 5x^2 + 2x + 3$ is

A. 0

B. 1

C. 2

D. ∞

Answer: B

52. If $\sqrt{3}\tan 2\theta + \sqrt{3}\tan 3\theta + \tan 2\theta\tan 3\theta = 1$ then the general value of θ is

A. $n\pi + \dfrac{\pi}{5}$

B. $\left(n + \dfrac{1}{6}\right)\dfrac{\pi}{5}$

C. $\left(2n \pm \dfrac{1}{6}\right)\dfrac{\pi}{5}$

D. $\left(n + \dfrac{1}{3}\right)\dfrac{\pi}{5}$

Answer: B

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53. If $\sin(\pi\cos\theta) = \cos(\pi\sin\theta)$, then of the value $\cos\left(\theta \pm \dfrac{\pi}{4}\right)$ is

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

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

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

D. None of these

54. The number of solutions of the equation

$$\sin\left(\frac{\pi x}{2\sqrt{3}}\right) = x^2 - 2\sqrt{3}x + 4$$

A. forms an empty set

B. is only one

C. is only two

D. is more than 2

55. If : $\sin 5x + \sin 3x + \sin x = 0$, where $0 < x \leq \dfrac{\pi}{2}$, then : $x =$

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

B. $\dfrac{\pi}{6}$

C. $\dfrac{\pi}{3}$

D. $\dfrac{\pi}{4}$

Answer: C

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56. the general solution of $\sin^2 \theta \sec \theta + \sqrt{3} \tan \theta = 0$ is

A. $\theta = n\pi + (-1)^{n+1} \dfrac{\pi}{3}, \theta = n\pi P : n \in I$

B. $\theta = n\pi, n \in I$

C. $\theta = \dfrac{n\pi}{2}, n \in I$

D. $\theta = n\pi + (1-)^{n+1} \dfrac{\pi}{2}, \theta = n\pi, n \in I$

Answer: B

57. The solution set of the system of equations $x + y = \dfrac{2\pi}{3},\ \cos x + \cos y = \dfrac{3}{2},$ where $x\,and\,y$ are real, is _____

A. $x = \dfrac{\pi}{3}n\pi,\ y = n\pi$

B. ϕ

C. $x = n\pi,\ y = \dfrac{\pi}{3} - n\pi$

D. None of these

Answer: B

58. The number of points of intersection of the curves $2y = 1$ and $y = \sin x$, $-2\pi \le x \le 2\pi$, is

A. 2

B. 3

C. 4

D. 1

Answer: C

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59. If $p_n = \cos^n \theta + \sin^n \theta$ then $p_n - p_{n-2} = kp_{n-4}$ where k

A. $k = 1$

B. $k = -\sin^2 \theta \cos^2 \theta$

C. $k = \sin^2 \theta$

D. $k = \cos^2 \theta$

Answer: B

60. In the interval $\left[-\dfrac{\pi}{2}, \dfrac{\pi}{2} \right]$ the equation $\log_{\sin \theta}(\cos 2\theta) = 2$ has

A. no solution

B. a unique solution

C. two solution

D. in finitely many solutions

Answer: B

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

A. 1, 2, 3

B. 3, 2, /3, 7/3

C. 4, 1/2, 3/2

D. None of these

Answer: A

62. In triangle $ABC, \angle C = 90°$ then $\dfrac{a^2 - b^2}{a^2 + b^2} =$

A. $\sin(A + B)$

B. $\sin(A - B)$

C. $\cos(A + B)$

D. $\sin\left(\dfrac{A - B}{2}\right)$

Answer: B

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63. In a triangle ABC, let $2a^2 + 4b^2 + c^2 = 2a(2b + c)$, then which of the following holds good?

A. 0

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

C. $\dfrac{3}{8}$

D. $\dfrac{7}{8}$

Answer: D

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64. The value of $\dfrac{1}{r_1^2} + \dfrac{1}{r_2^2} + \dfrac{1}{r_2^3} + \dfrac{1}{r^2}$, is

A. 0

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

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

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

Answer: B

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65. In two triangle ABC and DEF, AB= DE ,BC=DF and AC =Ef then

A. $\dfrac{\pi}{3}$

B. $\dfrac{\pi}{2}$

C. $\dfrac{2\pi}{3}$

D. $\dfrac{5\pi}{6}$

Answer: C

66. An observer in a boat finds that the angle of elevation of a tower standing on the top of a cliff is $60°$ and that of the top of cliff is $30°$. If the height of the tower be 60 meters, then the height of the cliff is

A. 30 m

B. $60\sqrt{3}m$

C. $20\sqrt{3}m$

D. None of these

Answer: A

67. The angular elevation of a tower OP at a point A due south of it is $60°$ and at a point B due west of A, the elevation is $30°$. If AB=3m, the height of the tower is

A. $2\sqrt{3}km$

B. $2\sqrt{6}km,$

C. $\dfrac{3\sqrt{3}}{2}km$

D. $\dfrac{3\sqrt{6}}{4}km$

Answer: D

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68. An aeroplane flying horizontally , 1km above the ground , is observed at an elevation of $60°$,after 10 seconds , its elevation is observed to be $30°$. Find the speed of the aeroplane in km/hr.

A. $60\sqrt{3}$

B. 240

C. $240\sqrt{3}$

D. 480

Answer: C

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69. A man whose eye leave is 1.5 meters above the ground observes the angle of elevation of the tower to be $60°$. If the distance of the man from the tower be 10 meters, the height of the tower is

A. $\left(1.5 + 10\sqrt{3}\right)$

B. $10\sqrt{3}m$

C. $\left(1.5 + \dfrac{10}{\sqrt{3}}\right)m$

D. None of these

Answer: A

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70. A and B are two points in the horizontal plane through O, the foot of pillar OP of height h such that $\angle AOB = \theta$. If the elevation of the top of the pillar from A and B are also equal to θ, then AB is equal to

A. $h \cot \theta$

B. $h \cos \theta \sec \dfrac{\theta}{2}$

C. $h \cot \theta \sin \dfrac{\theta}{2}$

D. $h \cos thea \cos ec \dfrac{\pi}{2}$

Answer: B

Exercise 2

1. The expression

$$\frac{1 + \sin 2\alpha}{\cos(2\alpha - 2\pi)\tan\left(\alpha - \frac{3\pi}{4}\right)} - \frac{1}{4}\sin 2\alpha\left[\cot\frac{\alpha}{2} + \frac{\alpha}{2}\right]$$

when simplified reduces to

A. 1

B. 0

C. $\sin^2(a/2)$

D. $\dfrac{1}{2} + \dfrac{1}{2}\sin^2(\alpha)$

Answer: D

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2. Solve the inequality, $\cos x \leq -\dfrac{1}{2}$.

A. $x \in \left[2n\pi + \dfrac{\pi}{6}, 2n\pi + \dfrac{\pi}{3}\right], n \in Z$

B. $x \in \left[2n\pi + \dfrac{2\pi}{3}, 2n\pi + \dfrac{4\pi}{3}\right], n \in Z$

C. $x \in \left[2n\pi - \dfrac{2\pi}{3}, 2n\pi + \dfrac{2\pi}{3}\right], n \in Z$

D. None of these

Answer: B

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3. Two men are on the opposite sides of a tower. They measure the angles of elevation of the top of the tower as $45°$ and $30°$ respectively. If the height of the tower is 40 m, then the distance between the men is

A. $40m$

B. $40\sqrt{3}m$

C. $68.280m$

D. $109.28m$

Answer: D

4. The range of vlaues of the expression $5\cos\theta + 3\cos\left(\theta + \dfrac{\pi}{3}\right) + 1$ is

   A. $[-7, 7]$

   B. $[-6, 8]$

   C. $[-8, 6]$

   D. $[-3, \sqrt{3}, 13]$

Answer: B

5. The value of $\dfrac{1 - \tan^2 15°}{1 + \tan^2 15°}$ is

A. 1

B. $\sqrt{3}$

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

D. 2

Answer: C

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6. Which pairs of function is identical ?

A. $f(x) = \sqrt{x^2}, g(x) = x$

B. $f(x) = \sin^2 x + \cos^2 x, g(x) = 1$

C. $f(x) = \dfrac{x}{x}, g(x) = 1$

D. None of these

Answer: B

7. If $y = (\sin x + \cos ecx)^2 + (\cos x + \sec x)^2$, then the minimum value of y, $\forall x \in R$, 7 (b) 3 (c) 9 (d) 0

A. 7

B. 3

C. 9

D. 0

Answer: C

8. If $\tan\left(\dfrac{\pi}{4} + \theta\right) + \tan\left(\dfrac{\pi}{4} - \theta\right) = p\sec 2\theta$ then the vlaue of p is equal to :

A. 2

B. 3

C. 1

D. 4

Answer: A

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9. Period of $\sin\theta - \sqrt{2}\cos\theta$ is

A. $\dfrac{\pi}{4}$

B. $\dfrac{\pi}{2}$

C. π

D. 2π

Answer: D

10. $\tan^6 20° - 33\tan^2 20° + 27\tan^2 20° + 4 =$

    A. 2

    B. 3

    C. 4

    D. 5

Answer: B

11. Which of the following is correct ?

    A. $\sin 1° \ \sin 1$

    B. $\sin 1° \ < \ \sin 1$

C. $\sin 1° = \sin 1$

D. $\sin 1° = \dfrac{\pi}{18}\sin 1$

Answer: B

12. if: $f(x) = \dfrac{\sin x}{\sqrt{1 + \tan^2 x}} - \dfrac{\cos x}{\sqrt{1 + \cot^2 x}}$, then find the range of $f(x)$

A. $[-1, 0$

B. $[0, 1]$

C. $[-1, 1]$

D. None of these

Answer: C

13. If $\sin x + \sin^2 x = 1$, then the value of

$\cos^{12} x + 3 \cos^{10} x + 3 \cos^8 x + \cos^6 x - 2$ is equal to

A. 1

B. $\cos^3 x \sin^3 x$

C. 0

D. ∞

Answer: A

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14. The value of $\sin \dfrac{\pi}{16} \sin \dfrac{3\pi}{16} \sin \dfrac{5\pi}{16} \sin \dfrac{7\pi}{16}$ is

A. $\dfrac{\sqrt{2}}{16}$

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

C. $\dfrac{1}{16}$

D. $\dfrac{\sqrt{2}}{32}$

Answer: A

---

15. General solution of the equation

$$2 \cot^2 \theta + 2\sqrt{3} \cot \theta + 4 \cos ec\theta + 8 = 0 \text{ is}$$

A. $\theta = n\pi \pm \dfrac{\pi}{6}, n \in I$

B. $n\pi + \dfrac{\pi}{6}, n \in I$

C. $2n\pi + \dfrac{\pi}{6}, nInI$

D. $2n\pi + \dfrac{11\pi}{6}, n \in I$

Answer: A

16. A man observe that was he has climbed up $\dfrac{1}{3}$ of the length of an inclined ladder ,placed against a wall the angular depression of an object on the floor is α and that after he reached the top of the ledder , the angular depression β If the inclintaion of the ladder to the is θ then prove that $\cot \theta = \dfrac{3 \cot \beta - \cot \alpha}{2}$

A. $\dfrac{3 \cot \beta - \cot \alpha}{2}$

B. $\dfrac{3 \cot \alpha - \cot \beta}{2}$

C. $\dfrac{\cot \beta - \cot \alpha}{2}$

D. $\dfrac{\cot \alpha + \cot \beta}{2}$

Answer: A

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17. The number of solutions of $\tan x + \sec x = 2 \cos x$ in $(0, 2\pi)$ is

A. 2

B. 3

C. 0

D. 1

Answer: B

18. If $\sin A = \dfrac{3}{5}, 0 < A < \dfrac{\pi}{2}$ and $\cos B = -\dfrac{12}{13}, \pi < B < \dfrac{3\pi}{2},$

then find the values of the following:

(i) $\sin(A - B)$

A. $-\dfrac{13}{82}$

B. $-\dfrac{15}{65}$

C. $-\dfrac{13}{75}$

D. $-\dfrac{16}{65}$

Answer: D

---

19. The domain of $f(x) = \sqrt{\cos(\sin x)} + \sqrt{\log_x \{x\}}$ where $\{x\}$ denotes fractional part of x.

A. $[1, \pi)$

B. $(0, 2\pi) - [1, \pi)$

C. $\left(0, \dfrac{\pi}{2}\right) - \{1\}$

D. $(0, 1)$

Answer: D

---

20. The range of $f(x) = \cos x - \sin x$ is

A. $[-1, 1]$

B. $[-1, -1]$

C. $[-\sqrt{2}, \sqrt{2}]$

D. $[-2, -2]$

Answer: C

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21. If P is a point on the altitude AD of the triangle ABC such the $\angle CBP = \dfrac{B}{3}$, then AP is equal to $2a\dfrac{\sin C}{3}$ (b) $2b\dfrac{\sin C}{3}$ $2c\dfrac{\sin B}{3}$ (d) $2c\dfrac{\sin C}{3}$

A. $2a\sin\dfrac{C}{3}$

B. $2b\sin\dfrac{C}{3}$

C. $2c\sin\dfrac{B}{3}$

D. $\dfrac{C}{3}$

Answer: C

22. From the top of a cliff 50 m high, the angles of depression of the top and bottom of a tower are observed to be $30°$ and $45°$. The height of tower is

   A. $50m$

   B. $50\sqrt{3}m$

   C. $50(\sqrt{3}-1)m$

   D. $50\left(1-\dfrac{\sqrt{3}}{3}\right)m$

Answer: D

23. The value of $\dfrac{1}{\sin 10°} - \dfrac{\sqrt{3}}{\cos 10°}$ is equal to

A. 0

B. 1

C. 2

D. 4

Answer: D

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24. What is the value of $\sin\left(\dfrac{5\pi}{12}\right)$?

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

B. $\dfrac{\sqrt{6}+\sqrt{2}}{4}$

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

D. $\dfrac{\sqrt{6}+1}{2}$

Answer: B

---

25. General solution of the equation $\tan\theta\tan 2\theta = 1$ is given by

A. $(2n + 1)\dfrac{\pi}{4}, \; ln \in I$

B. $n\pi + \dfrac{\pi}{6}, \; n \in I$

C. $n\pi - \dfrac{\pi}{6}, \; n \in I$

D. $n\pi \pm \dfrac{\pi}{6}, \; n \in I$

Answer: D

26. The minimum value of the function

$$f(x) = \frac{\sin x}{\sqrt{1 - \cos^2 x}} + \frac{\cos x}{\sqrt{1 - \sin^2 x}} + \frac{\tan x}{\sqrt{\sec^2 x - 1}} + \frac{\cot x}{\sqrt{cosec^2 x - 1}}$$

whenever it is defined is

A. 4

B. -2

C. 0

D. 2

Answer: B

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27. The value of $\cos ec 430° + \sqrt{3} \sec 470°$ is :

A. 1

B. 1

C. -4

D. 4

Answer: C

---

28. In a triangle ABC , if $\cos A = \dfrac{\sin B}{2 \sin C}$, show that the triangle is isosceles.

A. $a = b = c$

B. $c = a$

C. $a = b$

D. $b = c$

Answer: B

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

A. $\dfrac{-4}{5}$ but not $\dfrac{4}{5}$

B. $\dfrac{-4}{5}$ or $\dfrac{4}{5}$

C. $\dfrac{4}{5}$ but not $-\dfrac{4}{5}$

D. None of these

Answer: B

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30. 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

A. $4x$

B. $2x$

C. x

D. None of these

Answer: C

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