MATHS

BOOKS - CENGAGE MATHS (ENGLISH)

TRIGONOMETRIC RATIOS FOR COMPOUND, MULTIPLE, SUB-MULTIPLE ANGLES, AND TRANSFORMATION FORMULAS

Single Correct Answer Type

1. Given $a_1\cos\alpha_1 + \alpha_2\cos\alpha_2 + \ldots + a_n\cos\alpha_n = 0$ and $a_1\cos(\alpha_1+\theta) + a_2\cos(\alpha_2+\theta) + \ldots + a_n\cos(\alpha_n+\theta) = 0(\theta \neq k\pi)$, then the value of $a_1\cos(\alpha_1+\lambda) + a_2\cos(\alpha_2+\lambda) + \ldots + a_n\cos(\alpha_n+\lambda)$ is

A. $\theta - \lambda$

B. $\theta + \lambda$

C. λ

D. 0

Answer: D

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2. $\frac{\cos^2 33^\circ - \cos^2 57^\circ}{\sin 21^\circ - \cos 21^\circ} =$

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

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

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

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

Answer: B

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3. The value of $\frac{2\sin 40^\circ . \sin 50^\circ . \tan 10^\circ}{\cos 80^\circ}$ is

A. $1/2$

B. 1

C. 2

D. none of these

Answer: B

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4. The value of $\cos 65^\circ \cos 55^\circ \cos 5^\circ$ is

A. $\frac{\sqrt{3}+1}{8\sqrt{2}}$

B. $\frac{\sqrt{3}-1}{8\sqrt{2}}$

C. $\frac{\sqrt{3}+1}{4\sqrt{2}}$

D. $\frac{\sqrt{3}-1}{4\sqrt{2}}$

Answer: A

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5. 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. y

C. 3y

D. none of these

Answer: A

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6. If $\sin\theta + \sin 2\theta + \sin 3\theta = \sin\alpha$ and $\cos\theta + \cos 2\theta + \cos 3\theta = \cos\alpha$, then θ is equal to

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7. The value of $\frac{\sin 22^\circ \cos 8^\circ + \cos 158^\circ \cos 98^\circ}{\sin 23^\circ \cos 7^\circ + \cos 157^\circ \cos 97^\circ}$

A. 1

B. 2

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

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

Answer: A

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8. If $x = \cos\alpha + \cos\beta - \cos(\alpha + \beta)$ and $y = 4\sin.\frac{\alpha}{2}\sin.\frac{\beta}{2}\cos.\left(\frac{\alpha+\beta}{2}\right)$, then (x-y) equals

A. 0

B. 1

C. -1

D. -2

Answer: A

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9. The smallest positive value of x (in degrees) for whichcos $\tan x = \frac{\cos 5^\circ \cos 20^\circ + \cos 35^\circ \cos 50^\circ - \sin 50^\circ \sin 20^\circ - \sin 35^\circ \sin 50^\circ}{\sin 5^\circ \cos 20^\circ - \sin 35^\circ \cos 50^\circ + \cos 5^\circ \sin 20^\circ - \cos 35^\circ \sin 50^\circ}$ is equal to

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

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

C. $-\sqrt{3}$

D. $\sqrt{3}$

Answer: B

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10. Value of the expression $\frac{\sec 11^\circ \sec 19^\circ - 2\cot 71^\circ}{\tan 11^\circ}$ is equal to

A. $2\cot 11^\circ$

B. $\tan 19^\circ$

C. $2\tan 11^\circ$

D. $\frac{1}{9}\tan 19^\circ$

Answer: C

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11. α, β, γ are real number satisfying $\alpha + \beta + \gamma = \pi$. The minimum value of the given expression $\sin\alpha + \sin\beta + \sin\gamma$ is

A. zero

B. -3

C. positive

D. negative

Answer: A

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12. If $\sin\alpha = \frac{1}{\sqrt{5}}$ and $\sin\beta = \frac{3}{5}$, then $\beta - \alpha$ lies in

A. $[0, \pi/4]$

B. $[\pi/2, 3\pi/4]$

C. $[3\pi/4, \pi]$

D. none of these

Answer: A

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13. If in a ΔABC, $\tan A + \tan B + \tan C = 6$ then $\cot A \cot B \cot C =$ $a.6,\ b.\ 1,\ c.\ \frac{1}{6},\ d.$ none of these

A. $\frac{1}{6}$

B. 1

C. 6

D. none of these

Answer: A

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14. If $\cos\alpha + \cos\beta = 0 = \sin\alpha + \sin\beta$, then $\cos 2\alpha + \cos 2\beta$ is equal to $-2\sin(\alpha+\beta)$ (b) $-2\cos(\alpha+\beta)$ $2\sin(\alpha+\beta)$ (d) $2\cos(\alpha+\beta)$

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

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

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

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

Answer: C

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15. 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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16. Let α, β, γ be the measures of angle such that $\sin\alpha + \sin\beta + \sin\gamma \geq 2$. Then the possible value of $\cos\alpha + \cos\beta + \cos\gamma$ is

A. 3

B. 2.5

C. 2.4

D. 2

Answer: D

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17. The greatest value of $(2\sin\theta + 3\cos\theta + 4)^3 . (6 - 2\sin\theta - 3\cos\theta)^2$, as $\theta \in R$, is

A. 2345

B. 3456

C. 1234

D. 4567

Answer: B

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18. Let $x, y, \in R$ satisfy the condition such that sin x sin y + 3 cos y +4 sin y cos $x = \sqrt{26}$. The value of $\tan^2 x + \cot^2 y$ is equal to

A. 9×17

B. 205

C. $\frac{1}{16} + \frac{9}{17}$

D. none of these

Answer: C

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19. If α, β, γ are ccute angles and $\cos\theta = \sin\beta / \sin\alpha, \cos\varphi = \sin\gamma \sin\alpha and \cos(\theta - \varphi) = \sin\beta \sin\gamma$, then the value of $\tan^2\alpha - \tan^2\beta - \tan^2\gamma$ is equal to -1 (b) 0 (c) 1 (d) 2

A. -1

B. 0

C. 1

D. 2

Answer: B

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20. In a ΔABC, If $\tan\frac{A}{2}, \tan\frac{B}{2}, \tan\frac{C}{2}$ are in A.P. then $\cos A, \cos B, \cos C$ are in

A. A.P.

B. G.P.

C. H.P.

D. none of these

Answer: A

21. The value of $\frac{\sin(\pi-\alpha)}{\sin\alpha-\cos\alpha\tan.\frac{\alpha}{2}}-\cos\alpha$ is

A. -2

B. -1

C. 1

D. 2

Answer: C

22. the expression

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

simplifies and reduces to

A. 1

B. 0

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

D. $\sin^2\alpha$

Answer: D

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23. If $\tan\beta=\cos\theta\cdot\tan\alpha$, then $\tan^2\left(\frac{\theta}{2}\right)$ is equal to

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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24. If $\cos ec\theta = \frac{p+q}{p-q}$, then $\cot\left(\frac{\pi}{4}+\frac{\theta}{2}\right) =$

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

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

C. $\sqrt{pq}$

D. pq

Answer: B

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25. 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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26. The value of $2\left(\cos^2 20^\circ+\cos^2 140^\circ+\cos^2 100^\circ\right)$ is

A. $3/2$

B. 3

C. 4

D. none of these

Answer: B

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

A. $3/8$

B. $5/8$

C. $3/4$

D. $5/4$

Answer: B

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28. Let

$f(x) = \sin^2(x + \alpha) + \sin^2(x + \beta) - 2\cos(\alpha - \beta)\sin(x + \alpha)\sin(x + \beta)$

. Which of the following is TRUE ?

A. f(x) is strictly increasing in $x \in (\alpha, \beta)$

B. f(x) is strictly decreasing in $x \in (\alpha, \beta)$

C. f(x) is strictly increasing in $x \in \left(\alpha, \frac{\alpha+\beta}{2}\right)$ and strictly decreasing in $x \in \left(\frac{\alpha+\beta}{2}, \beta\right)$

D. f(x) is a constant function

Answer: D

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29. A and B are positive acute angles satisfying the equations $3\cos^2 A + 2\cos^2 B = 4$ and $\frac{3\sin A}{\sin B} = \frac{2\cos B}{\cos A}$, then $A + 2B$ is equal to (a) $\frac{\pi}{4}$ (b) $\frac{\pi}{3}$ (c) $\frac{\pi}{6}$ (d) $\frac{\pi}{2}$

A. $\pi/4$

B. $\pi/3$

C. $\pi/6$

D. $\pi/2$

Answer: D

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30. Find the exact value of the expression

$$T = \frac{\sin 40^\circ}{\sin 80^\circ} + \frac{\sin 80^\circ}{\sin 20^\circ} - \frac{\sin 20^\circ}{\sin 40^\circ}.$$

A. 1

B. 2

C. 3

D. 4

Answer: C

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31. If $\alpha = \frac{2\pi}{7}$ then $\tan\alpha\tan 2\alpha + \tan 2\alpha\tan 4\alpha + \tan 2\alpha\tan 4\alpha =$

A. -5

B. -3

C. -1

D. -7

Answer: D

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32. The value of x satisfying the equation $x = \sqrt{2+\sqrt{2-\sqrt{2+x}}}$ is

A. $2\cos 10^\circ$

B. $2\cos 20^\circ$

C. $2\cos 40^\circ$

D. $2\cos 80^\circ$

Answer: C

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33. If $3(\cos 2\phi - \cos 2\theta) = 1 - \cos 2\phi \cos 2\theta$, then $\tan\theta = k\tan\phi$, where $\theta, \phi \in \left(0, \frac{\pi}{2}\right)$, where k =

A. $\sqrt{2}$

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

C. $\sqrt{3}$

D. $\frac{1}{\sqrt{3}}$

Answer: A

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34. A function $f(\theta) = \sin^2\theta + 3\sin\theta\cos\theta + 5\cos^2\theta$ is defined $\forall\theta \in R$. Another function $g(\theta) = f\left(\frac{\pi}{2} - \theta\right)$ at the point θ where $f(\theta)$ is

minimum, then thevalue of $\frac{1}{g(\theta)}$ is

A. 2

B. 5

C. 3

D. 4

Answer: A

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35. The number of integers in the range of $3\sin^2 x + 3\sin x \cos x + 7\cos^2 x$ is

A. 3

B. 4

C. 5

D. 6

Answer: C

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36. The value of $\sum_{r=1}^{11} \tan^2\left(\frac{r\pi}{24}\right)$ is

A. 91

B. 85

C. 253/3

D. none of these

Answer: C

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37. If $\theta_1, \theta_2, \theta_3$ are the three values of $\theta \in [0, 2\pi]$ for which $\tan\theta = \lambda$ then the value of $\frac{\tan(\theta_1)}{3}\frac{\tan(\theta_2)}{3} + \frac{\tan(\theta_2)}{3}\frac{\tan(\theta_3)}{3} + \frac{\tan(\theta_3)}{3}\frac{\tan(\theta_1)}{3}$ is equal to

A. $1/3$

B. 1

C. 3

D. none of these

Answer: C

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38. 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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39. The value of $4\cos 18^\circ - \frac{3}{\cos 18^\circ} - 2\tan 18^\circ$ is equal to

A. 0

B. 1

C. $\sqrt{5} - 1$

D. $\sqrt{5} + 1$

Answer: A

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40. The value of $\frac{\cot 84^\circ \cot 48^\circ}{\cot 66^\circ \cot 78^\circ}$ is equal to

A. 1

B. 0

C. $\sqrt{3}$

D. none of these

Answer: A

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41. Find the positive integers p, q, r, s satisfying $\tan\left(\frac{\pi}{24}\right) = \left(\sqrt{p} - \sqrt{q}\right)\left(\sqrt{r} - s\right)$

A. 6

B. 7

C. 8

D. 9

Answer: C

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42. In a ΔABC, $2\sin A\cos B + 2\sin B\cos C + 2\sin C\cos A$ = $\sin A + \sin B + \sin C$, then ΔABC is (a) Isoceles (b) Right Angled (c) Acute (d) None of these

A. isosceles

B. right angled

C. acute angled

D. none of these

Answer: A

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43. If $\cos A, \cos B$ and $\cos C$ are the roots of the cubic $x^3 + ax^2 + bx + c = 0$ where A, B, C are the anglesof a triangle then find the value of $a^2 - 2b - 2c$.

A. 0

B. $1/2$

C. 1

D. 2

Answer: C

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44. If $A+B+C+D=2\pi$, prove that : $\cos A+\cos B+\cos C+\cos D=4\cos,\frac{A+B}{2}\cos,\frac{B+C}{2}\cos,\frac{C+A}{2}$

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

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

C. $1-4\sin.\frac{A+B}{2}\sin.\frac{B+C}{2}\sin.\frac{C+A}{2}$

D. $-1-4\cos.\frac{A+B}{2}\cos.\frac{B+C}{2}\cos.\frac{C+A}{2}$

Answer: A

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45. If A,B,C,D are the angles of quadrilateral, then find $\frac{\sum \tan A}{\sum \cot A}$.

A. cot A cot B cot C cot D

B. tan A tan B tan C tan D

C. $-\tan A \tan B \tan C \tan D$

D. $-\cot A \cot B \cot C \cot D$

Answer: B

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46. 5. if the expression $\cos^2\left(\frac{\pi}{11}\right) + \cos^2\left(\frac{2\pi}{11}\right) + \cos^2\left(\frac{3\pi}{11}\right) + \cos^2\left(\frac{4\pi}{11}\right) + \cos^2\left(\frac{5\pi}{11}\right)$ has the value equal to p/q in it lowest from ; then find (p+q)

A. $\frac{7}{4}$

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

C. $\frac{11}{4}$

D. $\frac{13}{4}$

Answer: B

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47. The value of $\cos(-89^\circ) + \cos(-87^\circ) + \cos(-85^\circ) + \ldots + \cos(85^\circ) + \cos(87^\circ) +$ is equal to

A. $\cos ec1^\circ$

B. $\sec 1^\circ$

C. $2\sec 1^\circ$

D. $2\cos ec1^\circ$

Answer: A

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48. In a triangle ABc , if $r^2 \cot\left(\frac{A}{2}\right)\cot\left(\frac{B}{2}\right)\cot\left(\frac{C}{2}\right) =$

A. acute angled

B. obtuse angled

C. right angled

D. none of these

Answer: D

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49. Consider the quantities such that $x_1, x_2, \ldots . x_{10}, \ -1 \leq x_1, x_2 \ldots , x_{10} \leq 1$ and $x_1^3 + x_2^3 + \ldots + x_{10}^3 = 0,$ then the maximum value of $x_1 + x_2 + \ldots . \ + x_{10}$ is

A. $10/3$

B. 10

C. $5/3$

D. 5

Answer: A

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50. The value of $\frac{\cos 25^\circ}{\sin 70^\circ \sin 85^\circ} + \frac{\cos 70^\circ}{\sin 25^\circ \sin 85^\circ} + \frac{\cos 85^\circ}{\sin 25^\circ \sin 70^\circ}$ is

A. $1/2$

B. 1

C. 2

D. $3/2$

Answer: C

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Multiple Correct Answers Type

1. If sec x + tan x =22/7 , find the value of tanx/2

A. the value of tan $\frac{x}{2} = \frac{29}{15}$

B. the value of tan $\frac{x}{2} = \frac{29}{15}$

C. the value of cosec x + cot $x = \frac{29}{15}$

D. thevalue of cosec x + cot $x = \frac{15}{29}$

Answer: B::C

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

A. cot x

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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3. If $(a-b)\sin(\theta+\phi)=(a+b)\sin(\theta-\phi)$ then

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4. If $\frac{\cos x-\cos\alpha}{\cos x-\cos\beta}=\frac{\sin^2\alpha\cos\beta}{\sin^2\beta\cos\alpha}$ then cos x =

A. (a) $\cos x=\frac{\cos\alpha+\cos\beta}{1-\cos\alpha\cos\beta}$

B. (b) $\cos x=\frac{\cos\alpha-\cos\beta}{1-\cos\alpha\cos\beta}$

C. (c) $\cos x=\frac{\cos\alpha+\cos\beta}{1+\cos\alpha\cos\beta}$

D. (d) $\cos x=\frac{\cos\alpha-\cos\beta}{1+\cos\alpha\cos\beta}$

Answer: A::C::D

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5. If $0 \leq \theta \leq \pi$ and $\sin\left(\frac{\theta}{2}\right) = \sqrt{1+\sin\theta} - \sqrt{1-\sin\theta}$, then the possible value of $\tan\theta$ is (a) $\frac{4}{3}$ (b) 0 (c) $-\frac{3}{4}$ (d) $-\frac{4}{3}$

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

B. 0

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

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

Answer: B::D

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6. The value of expression of $(\alpha\tan\gamma + \beta\cot\gamma)(\alpha\cot\gamma + \beta\tan\gamma) - 4\alpha\beta\cot^2 2\gamma$ depends on α (b) β

(c) γ (d) none of these

A. dependent on α

B. independent of γ

C. dependent on β

D. none of these

Answer: A::B::C

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