MATHS

BOOKS - MHTCET PREVIOUS YEAR PAPERS AND PRACTICE PAPERS

TRIGONOMETRIC FUNCTIONS OF COMPOUND ANGLES

Exercise 1 Topical Problems

1. If $\sin A + \cos A = \sqrt{2},$ then the value of $\cos^2$ A is

A. $\sqrt{2}$

B. $1/2$

C. 4

D. -1

Answer: B

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2. If $0 < \beta < \frac{\pi}{4}, \cos(\alpha + \beta) = \frac{3}{5}$ and $\cos(\alpha - \beta) = \frac{4}{5}$, then sin 2α is equal to

A. 0

B. 1

C. 2

D. None of these

Answer: B

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3. The value of $\tan 20^\circ + \tan 40^\circ + \sqrt{3}\tan 20^\circ \tan 40^\circ$ is

A. $\sqrt{12}$

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

C. $\sqrt{3}$

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

Answer: C

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4. If $\alpha, \beta \in \left(0, \frac{\pi}{2}\right), \sin\alpha = \frac{4}{5}$ and $\cos(\alpha+\beta) = -\frac{12}{13}$, then sin β is equal to

A. $\frac{63}{65}$

B. $\frac{61}{65}$

C. $\frac{3}{5}$

D. $\frac{5}{13}$

Answer: A

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5. If $\cos(\alpha+\beta)=\frac{4}{5}$ and $\sin(\alpha-\beta)=\frac{5}{13}$, were $0\leq,\beta\leq\frac{\pi}{4}$, then tan 2α is equal to

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

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

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

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

Answer: B

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6. If $A + B = 45^\circ$, then $(\cot A - 1)(\cot B - 1)$ is equal to

A. 3

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

C. -1

D. 2

Answer: D

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7. If $\tan\alpha = k\cot\beta$, then $\dfrac{\cos(\alpha-\beta)}{\cos(\alpha+\beta)}$ is equal to

A. $\dfrac{1+k}{1-k}$

B. $\dfrac{1-k}{1+k}$

C. $\dfrac{k+1}{k-1}$

D. $\dfrac{k-1}{k+1}$

Answer: A

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8. If $\alpha+\beta=\dfrac{\pi}{2}$ and $\beta+\gamma=\alpha$, then find the value of $\tan\alpha$.

A. $\tan\beta+\tan\gamma$

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

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

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

Answer: C

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9. $\dfrac{\cos 9^\circ + \sin 9^\circ}{\cos 9^\circ - \sin 9^\circ} = \tan 54^\circ$

A. $\tan 26^\circ$

B. $\tan 81^\circ$

C. $\tan 51^\circ$

D. $\tan 54^\circ$

Answer: D

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10. $\frac{\tan 80^\circ - \tan 10^\circ}{\tan 70^\circ}$

A. 0

B. 1

C. 2

D. 3

Answer: C

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11. यदि tan x =(3)/(4), pi lt xlt (3pi)/(2), तो sin ""(x)/(2), cos""(x)/(2) तथा tan""(x)/(2)` के मान ज्ञात कीजिए |

A. $-\frac{1}{\sqrt{10}}$

B. $\frac{3}{\sqrt{10}}$

C. $\frac{1}{\sqrt{10}}$

D. $-\frac{3}{\sqrt{10}}$

Answer: A

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12. $\cos^4\theta - \sin^4\theta$ is equal to

A. $1 + 2\sin^2\left(\frac{\theta}{2}\right)$

B. $\cos^2\theta - 1$

C. $1 - 2\sin^2\left(\frac{\theta}{2}\right)$

D. $1 + 2\cos^2\theta$

Answer: B

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13. If A,B and C are the angles of a triangle ,such that sec (A-B), sec A and sec (A+B) are in arithmatic progression ,then

A. $\cos ec^2 A = 2\cos ec^2 \frac{B}{2}$

B. $2\sec^2 A = \sec^2 \frac{B}{2}$

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

D. $\sec^2 B = \sec^2 \frac{A}{2}$

Answer: B

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14. The value of $\frac{\cot x - \tan x}{\cot 2x}$ is

A. 1

B. 2

C. `-1

D. 4

Answer: B

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15. $\sqrt{3}\cos\sec 20^0 - \sec 20^0$

A. 2

B. $\sin 20^\circ \cos ec40^\circ$

C. 4

D. $4\sin 20^\circ \cos ec40^\circ$

Answer: C

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16. Let α and β be such that $\pi < \alpha - \beta < 3\pi$. If $\sin\alpha + \sin\beta = -\frac{21}{65}$ and $\cos\alpha + \cos\beta = -\frac{27}{65}$, then the value of $\cos\frac{(\alpha-\beta)}{2}$ is

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

B. $\frac{6}{\sqrt{130}}$

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

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

Answer: A

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17. If $x + \frac{1}{x} = 2\cos\theta$, then $x^n + \frac{1}{x^n}$ is equal to

A. $2\sin n\theta$

B. $2\cos n\theta$

C. $\sin(2n\theta)$

D. $\cos(2n\theta)$

Answer: B

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18. $\frac{1 - \tan^2(45^\circ - A)}{1 + \tan^2(45^\circ - A)}$ is equal to

A. sin 2A

B. cos 2A

C. tan 2A

D. cot 2A

Answer: A

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19. If $\sqrt{\frac{1+\cos A}{1-\cos A}} = \frac{x}{y}$ then the value of tan A is

A. $\frac{x^2+y^2}{x^2-y^2}$

B. $\frac{2xy}{x^2+y^2}$

C. $\frac{2xy}{x^2-y^2}$

D. $\frac{2xy}{y^2-x^2}$

Answer: C

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20. If $\cos 2\alpha = \frac{3\cos 2\beta - 1}{3 - \cos 2\beta}$, then $\tan \alpha$ is equal to

A. $\sqrt{2}\tan\beta$

B. $\tan\beta$

C. $\sin 2\beta$

D. $\sqrt{2}\cot\beta$

Answer: A

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21. If $\tan A \& \tan B$ are the roots of the quadratic equation $x^2 - ax + b = 0$, then the value of $\sin^2(A + B)$ is:

A. $\frac{a^2}{a^2+(1-b)^2}$

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

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

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

Answer: A

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22. If $\sin 4A - \cos 2A = \cos 4A - \sin 2A$ $\left(\text{where, } 0 < A < \frac{\pi}{4}\right)$, then the value of tan 4A is

A. 1

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

C. $\sqrt{3}$

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

Answer: C

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23. For any angle θ the expression $\frac{2\cos 8\theta+1}{2\cos\theta+1}$ is eqaul to

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

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

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

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

Answer: C

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Exercise 2 Miscellaneous Problems

1. If $\sin A + \sin B = C$, $\cos A + \cos B = D$, then the value of $\sin(A + B)$=

A. CD

B. $\frac{CD}{C^2 + D^2}$

C. $\frac{C^2 + D^2}{2CD}$

D. $\frac{2CD}{C^2 + D^2}$

Answer: D

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2. If θ lies in the first quardrant and $\cos\theta = \frac{8}{17}$, then find the value of $\cos(30^\circ + \theta) + \cos(45^\circ - \theta) + \cos(120^\circ - \theta)$.

A. $\frac{23}{17}\left(\frac{\sqrt{3}-1}{2}+\frac{1}{\sqrt{2}}\right)$

B. $\frac{23}{17}\left(\frac{\sqrt{3}+1}{2}+\frac{1}{\sqrt{2}}\right)$

C. $\frac{23}{17}\left(\frac{\sqrt{3}-1}{2}-\frac{1}{\sqrt{2}}\right)$

D. $\frac{23}{17}\left(\frac{\sqrt{3}+1}{2}-\frac{1}{\sqrt{2}}\right)$

Answer: A

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3. If $\tan x+\tan\left(\frac{\pi}{3}-x\right)+\tan\left(\frac{2\pi}{3}+x\right)=3$, then

A. tan x =1

B. tan 2x =1

C. tan 3x = 1

D. None of these

Answer: C

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4. If $\sin(\theta+\alpha)=a$ and $\sin(\theta+\beta)=b$, then prove that $\cos(\alpha+\beta)-4ab\cos(\alpha-\beta)=1-2a^2-2b^2$.

A. $1-a^2-b^2$

B. $1-2a^2-2b^2$

C. $2+a^2+b^2$

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

Answer: B

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5. The expression $\cos^2(A-B)+\cos^2 B-2\cos(A-B)\cos A\cos B$ is

A. dependent on B

B. dependent on A and B

C. dependent on A

D. independent of A and B

Answer: C

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

A.

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

B. $\tan(\alpha+\beta)=\frac{q}{p-1}$

C. $\cos(\alpha+\beta)=1-q$

D. $\sin(\alpha+\beta)=-p$

Answer: A

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7. If $\cos(A-B)=\frac{3}{5} and tan A tan B=2,$ then $\cos A\cos B=\frac{1}{5}$ (b) $s\in As\in B=-\frac{2}{5}\cos A\cos B=-\frac{1}{5}$ (d) $s\in As\in B=-\frac{1}{5}$

A. $\cos A\cos B=\frac{1}{5}$

B. $\sin A\sin B=-\frac{2}{5}$

C. $\cos A \cos B = -\frac{1}{5}$

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

Answer: A

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

A. 0

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

C. -1

D. 1

Answer: D

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9. If $\frac{\pi}{2} < \alpha < \pi, \pi < \beta < 3\frac{\pi}{2}; \sin\alpha = \frac{15}{17}$ and $\tan\beta = \frac{12}{5}$, then the value of $\sin(\beta - \alpha)$ is (A) $-\frac{171}{221}$ (B) $-\frac{21}{221}$ (C) $\frac{21}{221}$ (D) $\frac{171}{221}$

A. $-\frac{171}{221}$

B. $-\frac{21}{221}$

C. $\frac{21}{221}$

D. $\frac{171}{221}$

Answer: D

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10. If $\sin\theta = \frac{12}{13}, \left(0 < \theta < \frac{\pi}{2}\right)$ and $\cos\phi = -\frac{3}{5}, \left(\pi < \phi < \frac{3\pi}{2}\right)$. Then , $\sin(\theta + \phi)$ will be

A. $\frac{-56}{61}$

B. $\frac{-56}{65}$

C. $\frac{1}{65}$

D. -56

Answer: B

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11. If $\tan A - \tan B = x$, and $\cot B - \cot A = y$, then find the value of $\cot(A - B)$.

A. $\frac{1}{x} + y$

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

C. $\frac{1}{x} - \frac{1}{y}$

D. $\frac{1}{x} + \frac{1}{y}$

Answer: D

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12. $\sin 4\theta$ can be written as

A. $4\sin\theta\left(1 - 2\sin^2\theta\right)\sqrt{1 - \sin^2\theta}$

B. $2\sin\theta\cos\theta\sin^2\theta$

C. $4\sin\theta - 6\sin^3\theta$

D. None of the above

Answer: A

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

A. AP

B. GP

C. HP

D. None of these

Answer: B

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14. If $\frac{2\sin\alpha}{\{1+\cos\alpha+\sin\alpha\}}=y$, then $\frac{\{1-\cos\alpha+\sin\alpha\}}{1+\sin\alpha}=$

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

B. y

C. 1-y

D. 1+y

Answer: B

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15. $\frac{\sin\theta+\sin 2\theta}{1+\cos\theta+\cos 2\theta}=$

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

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

C. $\tan\theta$

D. $\cot\theta$

Answer: C

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16. $\frac{\sin 3\theta - \cos 3\theta}{\sin\theta + \cos\theta} + 1 =$

A. $2\sin 2\theta$

B. $2\cos 2\theta$

C. $\tan 2\theta$

D. $\cot 2\theta$

Answer: A

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17. If $\tan\alpha = \frac{1}{7}$ and $\tan\beta = \frac{1}{3}$, then $\cos 2\alpha$ is equal to

A. $\sin 2\beta$

B. $\sin 4\beta$

C. $\sin 3\beta$

D. Note of these

Answer: B

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18. 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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19. $\sec^2 A(1+\sec 2A) = 2\sec 2A$

A. secA

B. 2 secA

C. sec2A

D. 2 sec 2A

Answer: D

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20. $2\sin A\cos^3 A - 2\sin^3 A\cos A =$

A. sin 4A

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

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

D. None of these

Answer: B

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