TRANSFORMATIONS

PREVIOUS EAMCET BITS

1. $\frac{\cos x}{\cos(x-2y)} = \lambda \Rightarrow \tan(x-y)\ \tan y =$ **[EAMCET 2009]**

1) $\frac{1+\lambda}{1-\lambda}$ 2) $\frac{1-\lambda}{1+\lambda}$ 3) $\frac{\lambda}{1+\lambda}$ 4) $\frac{\lambda}{1-\lambda}$

Ans: 2

Sol. $\frac{\cos(x-2y)}{\cos x} = \frac{1}{\lambda}$, using component to and dividendo:

$$\tan(x-y)\tan y = \frac{1-\lambda}{1+\lambda}$$

2. $\cos A \cos 2A \cos 4A ......\cos 2^{n-1} A =$ **[EAMCET 2009]**

1) $\frac{\sin 2^n A}{2^n \sin A}$ 2) $\frac{2^n \sin 2^n A}{\sin A}$ 3) $\frac{2^n \sin A}{\sin 2^n A}$ 4) $\frac{\sin A}{2^n \sin 2^n A}$

Ans: 1

Sol. $\frac{1}{2\sin A}[2\sin A \cos A \cos 2A \cos 4A ....]$

$$\cos\left[\left(2^{n-1}A\right)\right] = \frac{\sin\left(2^n A\right)}{2^n \sin A}$$

3. If α + β+ γ = 2θ, then $\cos\theta + \cos(\theta-\alpha) + \cos(\theta-\beta) + \cos(\theta-\gamma) =$ **[EAMCET 2008]**

1) $4\sin\frac{\alpha}{2}\cos\frac{\beta}{2}\sin\frac{\gamma}{2}$ 2) $4\cos\frac{\alpha}{2}\cos\frac{\beta}{2}\cos\frac{\gamma}{2}$

3) $4\sin\frac{\alpha}{2}\sin\frac{\beta}{2}\sin\frac{\gamma}{2}$ 4) $4\sin\alpha\sin\beta\sin\gamma$

Ans: 2

Sol. $\cos\theta + \cos(\theta-\alpha) + \cos(\theta-\beta) + \cos(\theta-\gamma)$

$$= 2\cos\left(\frac{2\theta-\alpha}{2}\right)\cos\left(\frac{\alpha}{2}\right) + 2\cos\left(\frac{2\theta-\beta-\gamma}{2}\right)\cos\frac{\beta-\gamma}{2}$$

$$= 2\cos\left(\frac{\beta+\gamma}{2}\right)\cos\left(\frac{\alpha}{2}\right) + 2\cos\frac{\alpha}{2}\cos\frac{\beta-\gamma}{2}$$

$$= 2\cos\frac{\alpha}{2}\left[\cos\frac{\beta+\gamma}{2} + \cos\frac{\beta-\gamma}{2}\right] = 4\cos\frac{\alpha}{2}\cos\frac{\beta}{2}\cos\frac{\gamma}{2}$$

4. $\sin A + \sin B = \sqrt{3}(\cos B - \cos A) \Rightarrow \sin 3A + \sin 3B =$ **[EAMCET 2007]**

1) 0 2) 2 3) 1 4) – 1

Ans: 1

Sol. Given $\sin A + \sin B = \sqrt{3}(\cos B - \cos A)$

$\left(\frac{\sqrt{3}}{2}\right)\cos A + \sin A\left(\frac{1}{2}\right) = \cos B\left(\frac{\sqrt{3}}{2}\right) - \sin B\left(\frac{1}{2}\right)$

$\Rightarrow \cos\left(A - \frac{\pi}{6}\right) = \cos\left(B + \frac{\pi}{6}\right)$

$A = -B \Rightarrow \sin 3A + \sin 3B = 0$

5. $A + C = 2B \Rightarrow \frac{\cos C - \cos A}{\sin A - \sin C}$ **[EAMCET 2005]**

1) cotB 2) cot2B 3) tan 2B 4) tan B

Ans: 4

Sol. $\frac{A+C}{2} = B$

$\frac{\cos C - \cos A}{\sin A - \sin C} = \frac{2\sin\frac{A+C}{2}\sin\frac{A-C}{2}}{2\cos\frac{A+C}{2}\sin\frac{A-C}{2}} = \tan B$

6. $A + B = C \Rightarrow \cos^2 A + \cos^2 B + \cos^2 C - 2\cos A\cos B\cos C =$ **[EAMCET 2005]**

1) 1 2) 2 3) 0 4) 3

Ans: 1

Sol. A + B = C

$\cos^2 A + \cos^2 B + \cos^2 C = 1 + \cos(A+B)\cos(A-B) + \cos^2 C$

$= 1 + \cos C\left[\cos(A-B) + \cos(A+B)\right]$

$= 1 + \cos(2\cos A\cos B)$

$\cos^2 A + \cos^2 B + \cos^2 C - 2\cos A\cos B\cos C = 1$

7. In ΔABC , $\cos\left(\frac{B+2C+3A}{2}\right) + \cos\left(\frac{A-B}{2}\right) =$ **[EAMCET 2004]**

1) – 1 2) 0 3) 1 4) 2

Ans: 2

Sol. $\cos\left(\frac{\pi+C+2A}{2}\right) + \cos\left(\frac{A-B}{2}\right)$

$= \cos\left(\frac{2\pi-B+A}{2}\right) + \cos\left(\frac{A-B}{2}\right) = 0$

8. $\cos\alpha, \sin(\beta-\gamma) + \cos\beta.\sin(\gamma-\alpha) + \cos\gamma.\sin(\alpha-\beta) = \ldots\ldots\ldots..$ **[EAMCET 2003]**

1) 0 2) 1/2 3) 1 4) 4cosαcosβcosγ

Ans: 1

Sol. $\Sigma\cos\alpha\sin(\beta-\gamma)$

$= \Sigma\cos\alpha(\sin\beta\cos\gamma - \cos\beta\sin\gamma) = 0$

9. $\sin 47° - \sin 25° + \sin 61° - \sin 11° =$ **[EAMCET 2003]**

1) cos 7° 2) sin 7° 3) 2 cos 7° 4) 2 sin 7°

Ans: 1

Sol. $\sin 47° - \sin 25° + \sin 61° - \sin 11°$

$= \sin 47° + \sin 61° - (\sin 25° + \sin 11°)$

$= 2\sin 54° \cos 7° - 2\sin 18° \cos 7°$

$= 2\cos 7°\left(\frac{\sqrt{5}+1}{4} - \frac{\sqrt{5}-1}{4}\right) = \cos 7°$

10. If A + B + C = 270°, then cos2A + cos2B + cos2C + 4sinAsinBsinC = …. **[EAMCET 2003]**
1) 0 2) 1 3) 2 4)3
Ans: 2

Sol. $\cos 2A + \cos 2B + \cos 2C = 1 - 4\sin A \sin B \sin C$
(or) Put A = B = C= 90°

11. $\cos^2 76° + \cos^2 16° - \cos 76° \cos 16° =$ **[EAMCET 2002]**
1) $\frac{1}{2}$ 2) 0 3) $-\frac{1}{4}$ 4) $\frac{3}{4}$
Ans: 4

Sol. $\cos^2 76° + 1 - \sin^2 16° - \frac{1}{2}(2\cos 76° \cos 16°)$

$= 1 + \cos(76° + 16°)\cos(76° - 16) - \frac{1}{2}(\cos 92° + \cos 16°)$

$= 1 + \frac{1}{2}\cos 92° - \frac{1}{2}\cos 92° - \frac{1}{4} = \frac{3}{4}$

$= \frac{3}{4}$

12. $\sum_{k=1}^{3} \cos^2\left((2k-1)\frac{\pi}{12}\right) =$ **[EAMCET 2002]**
1) 0 2) $\frac{1}{2}$ 3) $-\frac{1}{2}$ 4) $\frac{3}{2}$
Ans: 4

Sol. $\cos^2 \frac{\pi}{12} + \cos^2 \frac{3\pi}{12} + \cos^2 \frac{5\pi}{12}$

$\frac{1+\cos 30°}{2} + \frac{1+\cos 90°}{2} + \frac{1+\cos 150°}{2} = \frac{3}{2}$

13. If $\operatorname{cosec}\theta = \frac{p+q}{p-q}$, then $\cot\left(\frac{\pi}{4} + \frac{\theta}{2}\right)$ **[EAMCET 2001]**
1) $\sqrt{\frac{p}{q}}$ 2) $\sqrt{\frac{q}{p}}$ 3) $\sqrt{pq}$ 4) pq
Ans: 2

Sol. $\frac{1}{\sin\theta} = \frac{p+q}{p-q} \Rightarrow \frac{1+\sin\theta}{1-\sin\theta} = \frac{p}{q}$

$\Rightarrow \frac{1-\cos\left(\frac{\pi}{2}+\theta\right)}{1+\cos\left(\frac{\pi}{2}+\theta\right)} = \frac{p}{q} \Rightarrow \frac{2\sin^2\left(\frac{\pi}{4}+\frac{\theta}{2}\right)}{2\cos^2\left(\frac{\pi}{4}+\frac{\theta}{2}\right)} = \frac{p}{q}$

$\therefore\ \cot\left(\frac{\pi}{4}+\frac{\theta}{2}\right)=\sqrt{\frac{p}{p}}$

14. If $\sin\alpha+\sin\beta=a, \cos\alpha+\cos\beta=b$, then $\sin(\alpha+\beta)=$ **[EAMCET 2000]**

1) ab 2) a + b 3) $\frac{2ab}{a^2-b^2}$ 4) $\frac{2ab}{a^2+b^2}$

Ans: 4

Sol. $\sin\alpha+\sin\beta=a; \cos\alpha+\cos\beta=b$

$2\sin\left(\frac{\alpha+\beta}{2}\right)\cos\left(\frac{\alpha-\beta}{2}\right)=a; 2\cos\left(\frac{\alpha+\beta}{2}\right)\cos\left(\frac{\alpha-\beta}{2}\right)=b$

$\therefore\ \tan\left(\frac{\alpha+\beta}{2}\right)=\frac{a}{b}$

$$\sin(\alpha+\beta)=\frac{2\tan\left(\frac{\alpha+\beta}{2}\right)}{1+\tan^2\left(\frac{\alpha+\beta}{2}\right)}=\frac{2ab}{a^2+b^2}$$

15. If $\tan\theta_1=k\cot\theta_2$, then $\frac{\cos(\theta_1-\theta_2)}{\cos(\theta_1-\theta_2)}=$ **[EAMCET 2000]**

1) $\frac{1+k}{1-k}$ 2) $\frac{1-k}{1+k}$ 3) $\frac{k+1}{k-1}$ 4) $\frac{k-1}{k+1}$

Ans: 1

Sol. $\frac{\cos(\theta_1-\theta_2)}{\cos(\theta_1+\theta_2)}=\frac{\cos\theta_1\cos\theta_2+\sin\theta_1\sin\theta_2}{\cos\theta_1\cos\theta_2-\sin\theta_1\sin\theta_2}$

$\Rightarrow\frac{1+\tan\theta_1\tan\theta_2}{1-\tan\theta_1\tan\theta_2}=\frac{1+k}{1-k}$

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