

1. Find the values of :-

(i) $\sin 15^\circ$ (ii) $\cos 105^\circ$ (iii) $\tan 75^\circ$.

[Ans:- (i) $\frac{\sqrt{3}-1}{2\sqrt{2}}$ (ii) $\frac{1-\sqrt{3}}{2\sqrt{2}}$ (iii) $2+\sqrt{3}$]

2. Prove that $\tan(45^\circ + \theta) = \frac{1 + \tan \theta}{1 - \tan \theta}$

3. From the formula of $\sin(A+B)$ deduce the formulae of $\cos(A+B)$ and $\cos(A-B)$.

4. If $\sin \alpha = \frac{1}{\sqrt{10}}$ $\cos \beta = \frac{2}{\sqrt{5}}$ and α, β are positive acute angles, find the value of $\alpha(\alpha+\beta)$.

5. Prove the following identities:-

(i) $\sin 63^\circ 32' \sin 33^\circ 32' + \sin 26^\circ 28' \sin 56^\circ 28' = \frac{\sqrt{3}}{2}$

(ii) $1 + \tan \theta \cdot \tan \frac{\theta}{2} = \sec \theta$

(iii) $\frac{\cos 10^\circ - \sin 10^\circ}{\cos 10^\circ + \sin 10^\circ} = \tan 35^\circ$

(iv) $\tan 3A \tan 2A \tan A = \tan 3A - \tan 2A - \tan A$.

(v) $\tan 50^\circ = \tan 40^\circ + 2 \tan 10^\circ$

(vi) $\sec(\alpha+\beta) = \frac{\sec \alpha \sec \beta}{1 - \tan \alpha \tan \beta}$

6. If $A+B = 225^\circ$ show that $\frac{\cot A}{1 + \cot A} \cdot \frac{\cot B}{1 + \cot B} = \frac{1}{2}$.

7. If $p \sin(\alpha+x) = q \sin(\alpha+y)$, show that, $\tan x = \frac{q \sin y - p \sin x}{p \cos y - q \cos x}$

$\cot A \tan 2A \tan A$

(2)

8. Find the value of $\cos^2(\frac{\pi}{8} - \frac{\theta}{2}) - \sin^2(\frac{\pi}{8} + \frac{\theta}{2})$

9. If $\tan x - \tan y = a$ and $\cot y - \cot x = b$, prove that:-

$$\frac{1}{a} + \frac{1}{b} = \cot(x-y)$$

10. If $\tan \beta = \frac{\sin \alpha \cos \alpha}{2 + \cos^2 \alpha}$, prove that $3 \tan(\alpha - \beta) = 2 \tan \alpha$.

11. Find the maximum and minimum values of $3 \cos \theta + 4 \sin \theta + 5$. [Ans:- 10, and 0 respectively].

Prove:-
12. $\sin^2(\frac{\pi}{8} + \frac{\theta}{2}) - \sin^2(\frac{\pi}{8} - \frac{\theta}{2}) = \frac{1}{\sqrt{2}} \sin \theta$.

13. $\cos^2 A + \cos^2(A + \frac{\pi}{3}) + \cos^2(A - \frac{\pi}{3}) = \frac{3}{2}$.

14. A positive acute angle has been divided into 2 parts, whose tangents are $\frac{1}{2}$ and $\frac{1}{3}$. Find the angle.

15. If $\cos(A+B)\sin(C+D) = \cos(A-B)\sin(C-D)$, show that:-

$$\cot A \cdot \cot B \cdot \cot C = \cot D$$

16. If x and y be 2 real quantities, prove that the simultaneous equations $x+y = \frac{2\pi}{3}$ and $\cos x + \cos y = \frac{3}{2}$, possess no real solution.

17. $\tan 25^\circ = a$, prove that $\frac{\tan 155^\circ - \tan 115^\circ}{1 + \tan 155^\circ \tan 115^\circ} = \frac{1-a^2}{2a}$.

18. If $\frac{\tan(\alpha-\beta)}{\tan \alpha} + \frac{\sin^2 \gamma}{\sin^2 \alpha} = 1$, show that $\tan \alpha \tan \beta = \tan^2 \gamma$

19. If α and β are the two solutions of the equation $a \tan \theta + b \sec \theta = c$, express the value of $\tan(\alpha+\beta)$ in terms of a, b, c .

20. If $\sqrt{2} \cos A = \cos B + \cos^3 B$ and $\sqrt{2} \sin A = \sin B - \sin^3 B$, prove that $\sin(A-B) = \pm \frac{1}{3}$.