1. Show that: $\dfrac{\sin\theta}{\sqrt{(1-\sin^2\theta)}} = \tan\theta.$
2. Show that: $\cos^4 A + \sin^4 A + 2\sin^2 A \cos^2 A = 1.$
3. Prove that: $(a\sin\theta + b\cos\theta)^2 + (a\cos\theta - b\sin\theta)^2 = a^2 + b^2.$
4. Prove that: $\dfrac{\sin^3\theta + \cos^3\theta}{\sin\theta + \cos\theta} = 1 - \cos\theta\sin\theta.$
5. If $\sin\theta + \sin^2\theta = 1$, then prove that $\cos^2\theta + \cos^4\theta = 1.$
6. Prove that: $\cos^2\theta(1 + \tan^2\theta) + \sin^2\theta(1 + \cot^2\theta) = 2.$
7. Prove that: $\sin^2 A\cos^2 B + \cos^2 A\sin^2 B + \cos^2 A\cos^2 B + \sin^2 A\sin^2 B = 1.$
8. Prove that: $(1 - \sin\theta + \cos\theta)^2 = 2(1 + \cos\theta)(1 - \sin\theta).$
9. Prove that: $\sec^4\theta - \sec^2\theta = \tan^4\theta + \tan^2\theta.$
10. Prove that: $\sec^4\theta(1 - \sin^4\theta) - 2\tan^2\theta = 1.$
11. Prove that: $\dfrac{(2\cos^2\theta - 1)^2}{\cos^4\theta - \sin^4\theta} = 1 - 2\sin^2\theta.$
12. Prove that: $\dfrac{1 - \cos\theta}{1 + \cos\theta} = (\cot\theta - \operatorname{cosec}\theta)^2.$
13. Prove that: $9\sec^2\theta - 5\tan^2\theta = 5 + 4\sec^2\theta.$
14. If $x = a\sec^n\theta$, $y = b\tan^n\theta$, prove that $\left(\dfrac{x}{a}\right)^{\frac{2}{n}} - \left(\dfrac{y}{b}\right)^{\frac{2}{n}} = 1.$
15. Prove that: $\dfrac{\cos A}{1 + \sin A} + \dfrac{1 + \sin A}{\cos A} = 2\sec A.$
16. Solve the equation for θ: $\dfrac{\cos^2\theta}{\cot^2\theta - \cos^2\theta} = 3.$
17. Express $\cos A$ in terms of $\cot A$.

Short Answer Type Questions

18. Prove that: $\dfrac{\cos^3\theta+\sin^3\theta}{\cos\theta+\sin\theta}+\dfrac{\cos^3\theta-\sin^3\theta}{\cos\theta-\sin\theta}=2.$

19. Prove that: $\dfrac{\sin A+\cos A}{\sin A-\cos A}+\dfrac{\sin A-\cos A}{\sin A+\cos A}=\dfrac{2}{\sin^2 A-\cos^2 A}=\dfrac{2}{1-2\cos^2 A}$

20. Prove that: $\dfrac{\tan^2\theta}{\tan^2\theta-1}+\dfrac{\cos^2\theta}{\sin^2\theta-\cos^2\theta}=\dfrac{1}{\sin^2\theta-\cos^2\theta}.$

21. Prove that: $\dfrac{\sin\theta}{1-\dfrac{1}{\sin\theta}} + \dfrac{\dfrac{1}{\sin\theta}}{1-\sin\theta} = 1 + \sin\theta + \dfrac{1}{\sin\theta}$.

22. Prove that: $(1 + \cot\theta - \operatorname{cosec}\theta)(1 + \tan\theta + \sec\theta) = 2$.

23. Prove that: $(\sin\theta + \sec\theta)^2 + (\cos\theta + \operatorname{cosec}\theta)^2 = (1 + \sec\theta \operatorname{cosec}\theta)^2$.

24. If $\cos\theta + \sin\theta = \sqrt{2}\ \cos\theta$, prove that $\cos\theta - \sin\theta = \sqrt{2}\ \sin\theta$.

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

26. Prove that: $(\operatorname{cosec}\theta - \sin\theta).(\sec\theta - \cos\theta) = \dfrac{1}{\tan\theta + \cot\theta}$.

27. Prove that: $\sin\theta\,(1 + \tan\theta) + \cos\theta\,(1 + \cot\theta) = \sec\theta - \operatorname{cosec}\theta$.

28. Show that: $\operatorname{cosec}^2\theta - \tan^2(90° - \theta) = \sin^2\theta + \sin^2(90° - \theta)$.

29. If $7\sin^2 A + 3\cos^2 A = 4$, show that $\tan A = \dfrac{1}{\sqrt{3}}$.

30. For any acute angle θ, prove that

(*i*) $\sin^2\theta + \cos^2\theta = 1$ (*ii*) $1 + \cot^2\theta = \operatorname{cosec}^2\theta$

31. Prove that: $\dfrac{1}{\sec A - \tan A} - \dfrac{1}{\cos A} = \dfrac{1}{\cos A} - \dfrac{1}{\sec A + \tan A}$.