ASSIGNMENT-1-TRIGONOMETRY

1. Derive the formula for cos(x + y) using the unit circle.
2. If cos x = $\frac{-1}{2}$ and x in third quadrant, find the values of other trigonometric functions.
3. If tan x = -$\frac{4}{3}$ and x in second quadrant, find the values of sinx/2, cosx/2 and tan x/2
4. If sinx = $\frac{-3}{5}$ and x in quadrant III; find the values of sinx/2, cosx/2 and tan x/2
5. Prove that tan3xtan2xtanx = tan3x – tan 2x – tanx
6. Prove that cotxcot2x—cot2xcot3x –cot3xcotx =1
7. Prove that tan8A – tan7A – tanA = tan8A tan7A tanA
8. Prove that tan7x – tan 5x – tan 2x = tan 7x. tan 5x. tan 2x
9. If CosA = $-\frac{24}{25}$, CosB = $\frac{3}{5}$, find the values of Sin(A+B) , Cos(A+B) and Tan(A – B).
10. i) If sin x = $\frac{3}{5}$ and cos y = $\frac{-12}{13}$, $0 < x < \pi/2$ and $\pi/2 < y < \pi$, then find sin(x – y).

    ii) If sin A = $\frac{3}{5}$ and cos B = -$\frac{9}{41}$, A & B in quadrant II, then find sin(A – B)
11. a) If sinx = $\frac{3}{5}$, cosy = $\frac{-12}{13}$, x and y both lie in second quadrant, find:

    i) sin(x + y) ii) cos(x – y) iii) tan(x + y)

    b) If sinx = $\frac{4}{5}$, cosy = $\frac{-5}{13}$, $0 < x < \frac{\pi}{2}$; $\frac{\pi}{2} < y < \pi$, find:

    i) cos (x + y) ii) cos (x – y) iii) sin (x – y)
12. Prove that i) $\tan 56^\circ = \frac{\cos 11^\circ + \sin 11^\circ}{\cos 11^\circ - \sin 11^\circ}$ ii) $\tan 36^\circ = \frac{\cos 9^\circ - \sin 9^\circ}{\cos 9^\circ + \sin 9^\circ}$ iii) tan 70° = tan 20° + 2tan 50°
13. Prove that $\frac{\tan A + \tan B}{\tan A - \tan \mathbf{B}} = \frac{\sin(A+B)}{\sin(A-B)}$
14. Find the value of i) $\tan 15^0$ ii) $\tan\frac{\pi}{8}$
15. Find the value of $\frac{\cos(2\pi+\theta)\operatorname{cosec}(2\pi+\theta)\tan(\frac{\pi}{2}+\theta)}{\sec(\frac{\pi}{2}+\theta)\cos\theta\cot(\pi+\theta)}$
16. Evaluate: $\frac{\sin(180^0+\theta)\cos(360^0-\theta)\tan(270^0-\theta)}{\sec^2(90^0+\theta)\tan(-\theta)\sin(270^0+\theta)}$
17. Evaluate: $\frac{\tan(90^0-\theta)\sec(180^0-\theta)\sin(-\theta)}{\sin(180^0+\theta)\cot(360^0-\theta)\operatorname{cosec}(90^0-\theta)}$
18. Evaluate: $\frac{\cos(2\pi+\theta)\operatorname{cosec}(2\pi+\theta)\tan(\frac{\pi}{2}+\theta)}{\sec(\frac{\pi}{2}+\theta)\cos(2\pi-\theta)\cot(\pi+\theta)}$
19. Prove that $\frac{Co\sec(90+\theta)+Cot(450+\theta)}{Co\sec(90-\theta)+\tan(180-\theta)} + \frac{Tan(180+\theta)+Sec(180-\theta)}{Tan(360+\theta)-Sec(-\theta)} = 2$

20. i) If tanA = k tanB, show that $\sin(A + B) = \dfrac{k+1}{k-1}\sin(A - B)$

ii) If $\sin\alpha = k\sin\beta$; prove that $\tan\left(\dfrac{\alpha-\beta}{2}\right) = \dfrac{k-1}{k+1}\tan\left(\dfrac{\alpha+\beta}{2}\right)$

21. Prove that:

i) $(\cos\alpha + \cos\beta)^2 + (\sin\alpha + \sin\beta)^2 = 4\cos^2\left(\dfrac{\alpha-\beta}{2}\right)$

ii) $\dfrac{1}{\sin 10^\circ} - \dfrac{\sqrt{3}}{\cos 10^\circ} = 4$ iii) $\sqrt{2+\sqrt{2+2\cos 4x}} = 2\cos x$

22. Find the value of : i) sin75°cos15° + cos75°sin15° ii) cos47°sin17° - sin47°cos17°
iii) cos42°cos12° + sin42°sin12°

23. Prove that i) Sin780° Sin120° + Cos240° Sin390° = ½
ii) Sin600° Cos390° + Cos480° Sin150° = –1

24. Prove that $\dfrac{Cos11^\circ - Sin11^\circ}{Cos11^\circ + Sin11^\circ}$ = Tan34°

25. Prove that Cos(45° – A) Cos(45° – B) – Sin(45° – A) Sin(45° – B) = Sin(A +B)

26. If tan A = 5/6 and tan B = 1/11 prove that A + B = π/4

27. If TanA = $\dfrac{x}{x-1}$, TanB = $\dfrac{1}{2x-1}$, prove that A – B = $\dfrac{\pi}{4}$

28. If A + B = 45°, then prove that i) (1 + tan A)(1 + tan B) = 2 ii) (cotA – 1)(cotB – 1) = 2

29. If tan(A + B) = m and tan(A – B) = n, show that :

i) tan2A = $\dfrac{m+n}{1-mn}$ ii) tan2B = $\dfrac{m-n}{1+mn}$

30. Evaluate : i) Cos70° Cos10° + Sin70° Sin10°
ii) Sin(40° + θ) Cos(10° + θ) – Cos(40° + θ) Sin(10° + θ)

31. In quadrilateral ABCD , prove that
i) Sin(A+B) + Sin(C+D) = 0
ii) CosA CosB – CosC CosD = SinA SinB – SinC SinD

32. Show that $\sqrt{2+\sqrt{2+\sqrt{2+2\cos 8\theta}}} = 2\cos\theta$

33. Prove that $\cos 6x = 32\cos^6 x - 48\cos^4 x + 18\cos^2 x - 1$

34. Prove that $\cos 4x = 1 - 8\sin^2 x\cos^2 x$

35. Prove that tan 4x = $\dfrac{4\tan x(1-\tan^2 x)}{1-6\tan^2 x+\tan^4 x}$

36. Prove that : i) $\cos\left(\dfrac{\pi}{4}+x\right)+\cos\left(\dfrac{\pi}{4}-x\right) = \sqrt{2}\cos x$ ii) $\cos\left(\dfrac{3\pi}{4}+x\right)-\cos\left(\dfrac{3\pi}{4}-x\right) = -\sqrt{2}\sin x$

37. Prove that : i) $\dfrac{\cos 7x+\cos 5x}{\sin 7x-\sin 5x}$ = cotx ii) $\dfrac{\cos 9x-\cos 5x}{\sin 17x-\sin 3x} = -\dfrac{\sin 2x}{\cos 10x}$

iii) $\dfrac{\sin 5x+\sin 3x}{\cos 5x+\cos 3x}$ = tan4x iv) $\dfrac{\sin x+\sin 3x}{\cos x+\cos 3x}$ = tan2x

v) $\dfrac{\cos 4x+\cos 3x+\cos 2x}{\sin 4x+\sin 3x+\sin 2x}$ = cot3x vi) $\dfrac{\sin 5x-2\sin 3x+\sin x}{\cos 5x-\cos x} = \tan x$

vii) $\dfrac{Sinx+\sin 3x+\sin 5x+\sin 7x}{\cos x+\cos 3x+\cos 5x+\cos 7x}$ = tan4x

viii) $\dfrac{\sin 5x+\sin 7x+\sin 9x+\sin 11x}{\cos 5x+\cos 7x+\cos 9x+\cos 11x}=\tan 8x$

ix) $\dfrac{\sin 3x+\sin 5x+\sin 7x+\sin 9x}{\cos 3x+\cos 5x+\cos 7x+\cos 9x}=\tan 6x$

x) $\dfrac{\sin(x+y)-2\sin x+\sin(x-y)}{\cos(x+y)-2\cos x+\cos(x-y)}=\tan x$

xi) $\dfrac{(\cos x-\cos 3x)(\sin 8x+\sin 2x)}{(\sin 5x-\sin x)(\cos 4x-\cos 6x)}=1$

38. Prove that $\cos\alpha + \cos\beta + \cos\gamma + \cos(\alpha + \beta + \gamma) = 4\cos\dfrac{\alpha+\beta}{2}\cos\dfrac{\beta+\gamma}{2}\cos\dfrac{\gamma+\alpha}{2}$

39. Prove that i) $(\cos x - \cos y)^2 + (\sin x - \sin y)^2 = 4\sin^2\dfrac{x-y}{2}$

ii) $(\cos x + \cos y)^2 + (\sin x - \sin y)^2 = 4\cos^2\dfrac{x+y}{2}$

40. Prove that: i) $\dfrac{\sin x\sin 2x+\sin 3x\sin 6x}{\sin x\cos 2x+\sin 3x\cos 6x}=\tan 5x$ ii) $\dfrac{\cos 8x\cos 5x-\cos 12x\cos 9x}{\sin 8x\cos 5x+\cos 12x\sin 9x}=\tan 4x$

iii) $\dfrac{\sin 8x\cos x-\sin 6x\cos 3x}{\cos 2x\cos x-\sin 3x\sin 4x}=\tan 2x$ iv) $\cos 2x\cos\dfrac{x}{2}-\cos 3x\cos\dfrac{9x}{2}=\sin 5x\sin\dfrac{5x}{2}$

41. If $\tan(\alpha+\theta)=n\tan(\alpha-\theta)$, Show that $(n+1)\sin 2\theta = (n-1)\sin 2\alpha$

42. Prove that $\cos^2 x + \cos^2(x + 120^0) + \cos^2(x - 120^0) = 3/2$

43. Prove that $\sin x + \sin\left(x + \dfrac{2\pi}{3}\right) + \sin\left(x + \dfrac{4\pi}{3}\right) = 0$

44. Prove that $\cos 20^0\cos 40^0\cos 60^0\cos 80^0=\dfrac{1}{16}$

45. Prove that $\sin 20^0\sin 40^0\sin 60^0\sin 80^0=\dfrac{3}{16}$

46. Find the general solution of $\cos 3x + \cos x - \cos 2x = 0$

47. Solve i) $2\cos^2 x + 3\sin x = 0$ ii) $2\sin^2 x + \sin^2 2x = 2$ iii) $\sec^2 2x = 1 - \tan 2x$
iv) $\cos x + \cos 3x = 0$ v) $\tan x + \tan 2x + \tan 3x = \tan x\tan 2x\tan 3x$

48. Solve the following trigonometric equations:
i) $\cot^2 x + 3\operatorname{cosec} x + 3 = 0$ ii) $\sin x + \sin 2x + \sin 3x = 0$ iii) $\sin 2x - \sin 4x + \sin 6x = 0$
iv) $\tan^2 x + \cot^2 x = 2$ v) $\sec^2 x + \operatorname{cosec}^2 x = 4$ vi) $\sin 3x = \sin x$
vii) $\cos 3x = \sin 2x$ viii) $\sqrt{3}\cos x+\sin x=\sqrt{2}$

49. Prove that: i) $\sin 36^\circ = \sqrt{\dfrac{10-2\sqrt{5}}{4}}$ ii) $\cos 36^\circ = \dfrac{\sqrt{5}+1}{4}$ iii) $\sin 18^\circ = \dfrac{\sqrt{5}-1}{4}$

50. Show that $\dfrac{\sin x}{\cos 3x}+\dfrac{\sin 3x}{\cos 9x}+\dfrac{\sin 9x}{\cos 27x}=\dfrac{1}{2}(\tan 27x-\tan x)$