HOME WORK –1

(PROBLEMS BASED ON FUNDAMENTALS)

Q. Solve for θ:

1. $\sin 3\theta = 0$
2. $\cos^2(5\theta) = 0$
3. $\tan\theta = \sqrt{3}$
4. $\sin 2\theta = \sin\theta$
5. $\sin(9\theta) = \sin\theta$
6. $5\sin^2\theta + 3\cos^2\theta = 4$
7. $\tan(\theta - 15°) = 3\tan(\theta + 15°)$
8. $\tan^2(\theta) + \cot^2(\theta) = 2$
9. $\cos(\theta) + \cos(2\theta) + \cos(3\theta) = 0$
10. $\sin(2\theta) + \sin(4\theta) + \sin(6\theta) = 0$
11. $\tan(\theta) + \tan(2\theta) + \tan(\theta).\tan(2\theta) = 1$
12. $\tan(\theta) + \tan(2\theta) + \tan(3\theta) = \tan(\theta).\tan(2\theta).\tan(3\theta)$
13. $\cot^2\theta + \frac{3}{\sin\theta} + 3 = 0$
14. $2\tan\theta - \cot\theta = -1$
15. $\tan^2\theta + (1 - \sqrt{3})\tan\theta - \sqrt{3} = 0$
16. $\tan\theta + \tan\left(\theta + \frac{\pi}{3}\right) + \tan\left(\theta + \frac{2\pi}{3}\right) = 3$
17. $3\tan(\theta - 60°) = \tan(\theta + 60°)$
18. $\tan\theta + \tan 2\theta + \tan 3\theta = 0$
19. $\cos 2\theta \cos 4\theta = \frac{1}{2}$
20. $\cot\theta - \tan\theta = \cos\theta - \sin\theta$
21. $(1 - \tan\theta)(1 + \sin 2\theta) = 1 + \tan\theta$
22. $2\sin^2\theta + \sin^2 2\theta = 2$
23. $\sin 3\alpha = 4\sin\theta \sin(\theta + \alpha) \sin(\theta - \alpha),\ \alpha \neq n\pi, n \in Z$
24. $4\sin\theta \sin 2\theta \sin 4\theta = \sin 3\theta$

PRINCIPAL VALUE

Q. Find the principal value of

25. $\sin(\theta) = -\frac{1}{2}$.
26. $\sin(\theta) = \frac{1}{\sqrt{2}}$
27. $\tan(\theta) = -\sqrt{3}$
28. $\tan\theta = -1$
29. $\cos\theta = \frac{1}{2}$
30. $\cos\theta = -\frac{1}{2}$
31. $\tan\theta = -\sqrt{3}$
32. $\sec\theta = \sqrt{2}$.

SOLUTIONS IN CASE IF TWO EQUATIONS ARE GIVEN:

33. If $\sin(\theta) = \frac{1}{\sqrt{2}}$ and $\cos(\theta) = -\frac{1}{\sqrt{2}}$, then find the general values of θ

34. If $\sin(\theta) = \frac{1}{\sqrt{2}}$ and $\tan(\theta) = -1$, then find the general values of θ

35. If $\cos\theta = \frac{1}{\sqrt{2}}$ and $\tan\theta = -1$, then find the general value of θ

36. Find the most general value of θ which satisfy the equations $\sin\theta = \frac{1}{2}$ and $\tan\theta = \frac{1}{\sqrt{3}}$

DIFFERENT TYPES IF TRIGNOMETRIC EQUATION

TYPE–1

Q. Solve for x :

37. $5\cos 2x + 2\cos^2\left(\frac{x}{2}\right) + 1 = 0$

38. $4\sin^4 x + \cos^4 x = 1$

39. $4\cos^2 x \sin x - 2\sin^2 x = 2\sin x$

40. $\sin 3x + \cos 2x = 1$

41. $2\cos 2x + \sqrt{2\sin x} = 2$

42. $1 + \sin^3 x + \cos^3 x = \frac{3}{2}\sin 2x$

43. $\sin^6 x + \cos^6 x = \frac{7}{16}$

44. $\sin^8 x + \cos^8 x = \frac{17}{16}\cos^2 2x$

45. $2\sin^3 x + 2 = \cos^2 3x$

46. $\cos 4x = \cos^2 3x$

47. $\cos 2x = 6\tan^2 x - 2\cos^2 x$

TYPE–2

Q. Solve for x :

48. $(2\sin x - \cos x)(1 + \cos x) = \sin^2 x$

49. $2\sin^2 x + \sin x - 1 = 0$ where $0 \le x \le 2\pi$

50. $5\sin^2 x + 7\sin x - 6 = 0$ where $0 \le x \le 2\pi$

51. $\sin^2 x - \cos x = \frac{1}{4}$, where $0 \le x \le 2\pi$

52. $\tan^2 x - 2\tan x - 3 = 0$

53. $2\cos^2 x - \sqrt{3}\sin x + 1 = 0$

TYPE–3

Q. Solve for x :

54. $\sin x + \sin 3x + \sin 5x = 0, 0 \le x \le \frac{\pi}{2}$

55. $\cos x - \cos 2x = \sin 3x$

56. $\sin 7x + \sin 4x + \sin x = 0, 0 \le x \le \frac{\pi}{2}$

57. $\cos 3x + \cos 2x = \sin\left(\frac{3x}{2}\right) + \sin\left(\frac{x}{2}\right), 0 \le x \le 2\pi$

58. $\sin x + \sin 2x + \sin 3x = \cos x + \cos 2x + \cos 3x, -\pi \le x \le 2\pi$

59. $\cos 2x + \cos 4x = 2\cos x$

60. $\sin 2x + \cos 2x + \sin x + \cos x + 1 = 0$

61. $\tan x + \tan 2x + \tan 3x = 0$

62. $\tan 3x + \tan x = 2\tan 2x$

63. $(1 - \tan x)(1 + \sin 2x) = (1 + \tan x)$

64. $\sin x - 3\sin 2x + \sin 3x = \cos x\, 3\cos 2x + \cos 3x$

Answer Key

1. $\theta = \frac{n\pi}{3}$

2. $\theta = \frac{1}{5}\left(n\pi \pm \left(\frac{\pi}{2}\right)\right)$

3. $\theta = n\pi + \left(\frac{\pi}{3}\right)$

4. $\theta = n\pi$ and $\theta = 2n\pi \pm \frac{\pi}{3}$

5. $\theta = (2n+1)\frac{\pi}{10}$ and $\theta = \left(\frac{n\pi}{4}\right)$

6. $\theta = n\pi \pm \left(\frac{\pi}{4}\right)$

7. $\theta = (4n+1)\frac{\pi}{4}$

8. $\theta = n\pi \pm \left(\frac{\pi}{4}\right)$

9. $\theta = (2n+1)\left(\frac{\pi}{4}\right)$ and $\theta = n\pi \pm \left(\frac{2\pi}{3}\right)$

10. $\theta = \left(\frac{n\pi}{4}\right)$ and $\theta = \left(\frac{n\pi}{2}\right) \pm \left(\frac{\pi}{3}\right)$

11. $\theta = \left(\frac{n\pi}{3}\right) + \left(\frac{\pi}{12}\right)$

12. $\theta = \left(\frac{n\pi}{3}\right), n \in I$

13. $\theta = (4n-1)\frac{\pi}{2}, \theta = n\pi + (-1)^n\left(-\frac{\pi}{6}\right)$

14. $\theta = \left(n\pi - \frac{\pi}{4}\right), \theta = n\pi + \alpha, \alpha = \tan^{-1}\left(\frac{1}{2}\right)$

15. $\theta = n\pi + \frac{\pi}{3}, \theta = n\pi - \frac{\pi}{4}$

16. $\theta = \frac{n\pi}{3} + \frac{\pi}{12}$

17. no solution.

18. $\theta = n\pi \pm \alpha\,, \alpha = tan^{-1}\left(\frac{1}{\sqrt{2}}\right)$

20. $\theta = n\pi + \frac{\pi}{4}$

21. $\theta = n\pi - \frac{\pi}{4}, \theta = n\pi, n \in I$

22. $\theta = (2n+1)\frac{\pi}{2}, \theta = n\pi \pm \frac{\pi}{4}$

23. $\theta = n\pi \pm \frac{\pi}{3}$

24. $\theta = n\pi, \theta = n\pi \pm \frac{\pi}{3}$

25. $\left(-\frac{\pi}{6}\right)$ 26. $\frac{\pi}{4}$ 27. $-\frac{\pi}{3}$ 28. $-\frac{\pi}{4}$ 29. $\frac{\pi}{3}$ 30. $\frac{2\pi}{3}$

31. $-\frac{\pi}{3}$ 32. $\frac{\pi}{4}$ 33. $\left(2n\pi + \frac{3\pi}{4}\right)$ 34. $\left(2n\pi + \frac{3\pi}{4}\right)$ 35. $2n\pi + \frac{7\pi}{4}$ 36. $2n\pi + \frac{\pi}{3}$

37. $2n\pi \pm \frac{\pi}{3}$ 38. $n\pi, x = n\pi \pm \alpha, \alpha = \sin^{-1}\left(\sqrt{\frac{2}{5}}\right)$ 39. $n\pi, x = (4n+1)\frac{\pi}{2}$

40. $n\pi, x = n\pi + (-1)^n\alpha, \alpha = \sin^{-1}\left(\frac{\sqrt{13}-1}{4}\right)$ 41. $n\pi, n = n\pi + (-1)^n\left(\frac{\pi}{4}\right)$

42. $n\pi + (-1)^n\left(-\frac{\pi}{4}\right) - \frac{\pi}{4}$ 43. $\frac{n\pi}{3} \pm \frac{\pi}{6}$ 44. $\frac{n\pi}{2} \pm \frac{\alpha}{2}, \alpha = \sin^{-1}\left(\sqrt{\frac{\sqrt{5}-1}{4}}\right)$ 45. $(4n-1)\frac{\pi}{2}$,

46. $n\pi$ 47. $n\pi \pm \frac{\pi}{6}$ 48. $x = 2n\pi \pm \pi, x = n\pi + (-1)^n\frac{\pi}{6}, n \in Z$

49. $\frac{\pi}{6}, \frac{5\pi}{6}, \frac{3\pi}{2}$ 50. $\sin^{-1}\left(\frac{3}{5}\right), \pi - \sin^{-1}\left(\frac{3}{5}\right)$

51. $\frac{\pi}{3}, \frac{5\pi}{3}$ 52. $n\pi - \frac{\pi}{4}, x = n\pi + \alpha, \alpha = \tan^{-1}(3)$ 53. $n\pi + (-1)^n\left(\frac{\pi}{3}\right)$

54. $0, \frac{\pi}{3}$ 55. $n\pi + \frac{\pi}{4}, 2n\pi - \frac{\pi}{2}$ 56. $0, \frac{2\pi}{9}, \frac{\pi}{4}, \frac{\pi}{2}$

57. $\frac{\pi}{3}, \frac{\pi}{5}, \frac{3\pi}{5}, \frac{13\pi}{15}, \frac{17\pi}{15}, \frac{7\pi}{5}, \frac{5\pi}{3}, \frac{29\pi}{15}$ 59. $\frac{2n\pi}{3} \pm \frac{2\pi}{9}, x = (2n+1)\frac{\pi}{2}$ 60. $n\pi - \frac{\pi}{4}, x = 2n\pi \pm \frac{2\pi}{3}$

62. $\frac{n\pi}{2}, x = n\pi$ 63. $n\pi, x = n\pi - \frac{\pi}{4}$ 64. $\frac{n\pi}{2} + \frac{\pi}{8}$