

7.3 Solving trigonometric equations

In-class work:

1. Solve in $[0, 2\mathbf{p})$: $\sin x = 0$.
2. Solve in \mathbb{R} : $\sin x = 0$.
3. Solve in \mathbb{R} : $2\sin x - 1 = 0$.
4. Solve in \mathbb{R} : $\sin(2\mathbf{q}) = 1$. Then give all solutions in $[0, 2\mathbf{p})$.
5. Solve in $[0, 2\mathbf{p})$: $\cos(2\mathbf{q}) = -\frac{1}{2}$.
6. Solve in $[0, 2\mathbf{p})$: $\sin x = a$, where $|a| \leq 1$.
7. Solve in \mathbb{R} : $\sin x = 0.3$.
8. Solve in $[0, 2\mathbf{p})$: $\cos t = b$, where $|b| \leq 1$.
9. Solve in $[0, 2\mathbf{p})$: $\tan x = c$. Then give all solutions in \mathbb{R} .
10. Solve in $[0, 2\mathbf{p})$: $2\tan x + 2 = 0$.
11. Solve in \mathbb{R} : $4\sin t - \sqrt{3} = 2\sin t$.
12. Solve in $[0, 2\mathbf{p})$: $4\sin \mathbf{q} - 3 = 0$.
13. Solve in $[0, 2\mathbf{p})$: $\cos t = -0.9$. Round to two decimal places.
14. Solve in $[0, 2\mathbf{p})$: $\sin^2 y = \frac{1}{2}$.
15. Solve in $[0, 2\mathbf{p})$: $2\sin^2 x - \sin x - 1 = 0$.
16. Solve in $[0, 2\mathbf{p})$: $\sin 2t - \cos t = 0$.
17. Solve in $[0, 2\mathbf{p})$: $\cos x - \cos 2x = 0$.
18. Solve in $[0, 2\mathbf{p})$: $\sin \mathbf{q} + \cos \mathbf{q} = \sqrt{2}$.
19. Solve in $[0, 2\mathbf{p})$: $\sqrt{3}\sin x + \cos x = \sqrt{3}$.

20. Solve in \mathbb{R} : $\sin \frac{t}{2} - \cos t = 0$.

21. Solve in \mathbb{R} : $2 \sin \frac{t}{3} + \sqrt{3} = 0$.

22. Solve in $[0, 2\mathbf{p})$: $\sin \left(3y - \frac{\mathbf{p}}{4} \right) = 1$.

23. Solve in \mathbb{R} : $2 \cos 3\mathbf{q} = 1$. Then give all solutions in $[0, 2\mathbf{p})$.

24. Solve in \mathbb{R} : $\sec \frac{t}{2} = \cos \frac{t}{2}$.

25. Solve in \mathbb{R} : $\csc 3x = 5 \sin 3x$. Then give all solutions in $[0, 2\mathbf{p})$.

26. Solve in $[0, 2\mathbf{p})$: $\sin 2x \cos x - \cos 2x \sin x = \frac{\sqrt{3}}{2}$.

27. Solve in $[0, 2\mathbf{p})$: $\cos 2\mathbf{q} - \cos^2 \mathbf{q} = 0$.

28. Solve in $[0, 2\mathbf{p})$: $\sin x - \cos x = \frac{1}{2}$.

Answers:

1) $0, \mathbf{p}$; 2) $k\mathbf{p}, k \in \mathbb{Z}$; 3) $\frac{\mathbf{p}}{6} + 2k\mathbf{p}, \frac{5\mathbf{p}}{6} + 2k\mathbf{p}, k \in \mathbb{Z}$; 4) $\frac{\mathbf{p}}{4}, \frac{5\mathbf{p}}{4}$; 5) $\frac{\mathbf{p}}{3}, \frac{2\mathbf{p}}{3}, \frac{4\mathbf{p}}{3}, \frac{5\mathbf{p}}{3}$; 6) $\sin^{-1} a, \mathbf{p} - \sin^{-1} a$;

7) $\sin^{-1} 0.3 + 2k\mathbf{p}, \mathbf{p} - \sin^{-1} 0.3 + 2k\mathbf{p}$; 8) $\cos^{-1} b, 2\mathbf{p} - \cos^{-1} b$; 9) $\tan^{-1} c + k\mathbf{p}, k \in \mathbb{Z}$; 10) $\frac{3\mathbf{p}}{4}, \frac{7\mathbf{p}}{4}$;

11) $\frac{\mathbf{p}}{3} + 2k\mathbf{p}, \frac{2\mathbf{p}}{3} + 2k\mathbf{p}$; 12) $\sin^{-1} \frac{3}{4}, \mathbf{p} - \sin^{-1} \frac{3}{4}$; 13) 2.69m 3.59; 14) $\frac{\mathbf{p}}{4}, \frac{3\mathbf{p}}{4}, \frac{5\mathbf{p}}{4}, \frac{7\mathbf{p}}{4}$; 15) $\frac{\mathbf{p}}{2}, \frac{1\mathbf{p}}{6}, \frac{7\mathbf{p}}{6}$;

17) $0, \frac{2\mathbf{p}}{3}, \frac{4\mathbf{p}}{3}$; 18) $\frac{\mathbf{p}}{4}$; 19) $\frac{\mathbf{p}}{6}, \frac{\mathbf{p}}{2}$; 22) $\frac{\mathbf{p}}{4}, \frac{11\mathbf{p}}{12}, \frac{19\mathbf{p}}{12}$; 23) $\frac{\mathbf{p}}{9} + \frac{2\mathbf{p}}{3}k, \frac{5\mathbf{p}}{9} + \frac{2\mathbf{p}}{3}k$; 24) $2k\mathbf{p}$;

25) $0.15 + \frac{2\mathbf{p}}{3}k, 0.89 + \frac{2\mathbf{p}}{3}k, 1.20 + \frac{2\mathbf{p}}{3}k, 1.94 + \frac{2\mathbf{p}}{3}k$ or, equivalently, $0.15 + \frac{\mathbf{p}}{3}k, 0.89 + \frac{\mathbf{p}}{3}k$;

26) $\frac{\mathbf{p}}{3}, \frac{2\mathbf{p}}{3}$; 27) $0, \mathbf{p}$; 28) 1.15, 3.57.