WS Solving Basic Trig Equations with Factoring – Review Name Key

Solve the following equations over $[0, 2\pi)$.

1. $\cot x + 1 = 0$

$\cot x = -1$

$x = \frac{3\pi}{4}, \frac{7\pi}{4}$

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

$2\cos x = -1$

$\cos x = -\frac{1}{2}$

$x = \frac{2\pi}{3}, \frac{4\pi}{3}$

3. $\sin x + 2 = 0$

$\sin x = -2$

$\emptyset$

4. $2\sin x - 1 = 0$

$2\sin x = 1$

$\sin x = 1/2$

$x = \frac{\pi}{6}, \frac{5\pi}{6}$

5. $\sin x + \sqrt{2} = -\sin x$

$2\sin x = -\sqrt{2}$

$\sin x = -\frac{\sqrt{2}}{2}$

$x = \frac{5\pi}{4}, \frac{7\pi}{4}$

6. $\csc^2 x + 2 = 4$

$\csc^2 x = 2$

$\csc x = \pm\sqrt{2}$

$\sin x = \pm\frac{1}{\sqrt{2}}$

$\sin x = \pm\frac{\sqrt{2}}{2}$

$x = \frac{\pi}{4}, \frac{3\pi}{4}, \frac{5\pi}{4}, \frac{7\pi}{4}$

7. $\tan x + \sqrt{3} = 0$

$\tan x = -\sqrt{3}$

$x = \frac{2\pi}{3}, \frac{5\pi}{3}$

8. $\sqrt{2}\sin x + 1 = 0$

$\sqrt{2}\sin x = -1$

$\sin x = -\frac{1}{\sqrt{2}}$

$\sin x = -\frac{\sqrt{2}}{2}$

$x = \frac{5\pi}{4}, \frac{7\pi}{4}$

9. $7 + \cos x = 4 - 5\cos x$

$6\cos x = -3$

$\cos x = -1/2$

$x = \frac{2\pi}{3}, \frac{4\pi}{3}$

10. $-5 + 2\cos x = -2 + \cos x$

$\cos x = 3$

$\emptyset$

11. $4 + 7\cot x = -2\sqrt{3} + \cot x + 4$

$6\cot x = -2\sqrt{3}$

$\cot x = -\sqrt{3}/3$

$x = \frac{2\pi}{3}, \frac{5\pi}{3}$

12. $-6 + 3\tan x = \sqrt{3} - 6$

$3\tan x = \sqrt{3}$

$\tan x = \sqrt{3}/3$

$x = \pi/6, 7\pi/6$

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

$\tan^2 x = 3$

$\tan x = \pm\sqrt{3}$

$x = \pi/3, 2\pi/3, 4\pi/3, 5\pi/3$

14. $3\tan^2 x - 1 = 0$

$3\tan^2 x = 1$

$\tan^2 x = \frac{1}{3}$

$\tan x = \pm\frac{1}{\sqrt{3}}$

$\tan^2 x = \pm\frac{\sqrt{3}}{3}$

$x = \pi/6, 5\pi/6, 7\pi/6, 11\pi/6$

15. $\tan x(\tan x - 1) = 0$

$\tan x = 0$ $\tan x = 1$

$x = 0, \pi$ $x = \pi/4, 5\pi/4$

16. $2\cos^2 x - \sqrt{3}\cos x = 0$

$\cos x(2\cos x - \sqrt{3}) = 0$

$\cos x = 0$ $2\cos x = \sqrt{3}$

$\cos x = \frac{\sqrt{3}}{2}$

$x = \frac{\pi}{2}, \frac{3\pi}{2}$ $x = \frac{\pi}{6}, \frac{11\pi}{6}$

17. $\sin^2 x - \sin x = 2$

$\sin^2 x - \sin x - 2 = 0$

$(\sin x - 2)(\sin x + 1) = 0$

$\sin x = 2$ $\sin x = -1$

$x = 3\pi/2$

18. ~~$1 + \tan^2 x + \tan x = 3$~~ $1 + \sec^2 x + \sec x = 3$

$\sec^2 x + \sec x - 2 = 0$

$(\sec x + 2)(\sec x - 1) = 0$

$\sec x = -2$ $\sec x = 1$

$\cos x = -1/2$ $\cos x = 1$

$x = \frac{2\pi}{3}, \frac{4\pi}{3}, 0\pi$

19. $1 + \tan^2 x + \tan x = 1$

$\tan^2 x + \tan x = 0$

$\tan x(\tan x + 1) = 0$

$\tan x = 0$ $\tan x = -1$

$x = 0, \pi, 3\pi/4, 7\pi/4$

20. $1 - \cos^2 x + \cos x = -1$

$-\cos^2 x + \cos x + 2 = 0$

$\cos^2 x - \cos x - 2 = 0$

$(\cos x - 2)(\cos x + 1) = 0$

$\cos x = 2$ $\cos x = -1$

$x = \pi$

21. $2\sin^2 x - \sin x = 1$

$2\sin^2 x - \sin x - 1 = 0$

$(2\sin x + 1)(\sin x - 1) = 0$

$\sin x = -1/2$ $\sin x = 1$

$x = 7\pi/6, 11\pi/6$ $x = \pi/2$

22. ~~2~~ $- 2\cos^2 x = $ ~~2~~ $+ \cos x$

$0 = 2\cos^2 x + \cos x$

$\cos x(2\cos x + 1) = 0$

$\cos x = 0$ $\cos x = -\frac{1}{2}$

$x = \pi/2, 3\pi/2$ $x = \frac{2\pi}{3}, \frac{4\pi}{3}$

23. $\sec^2 x - \sec x = 2$

$\sec^2 x - \sec x - 2 = 0$

$(\sec x - 2)(\sec x + 1) = 0$

$\sec x = 2$ $\sec x = -1$

$\cos x = \frac{1}{2}$ $\cos x = -1$

$x = \frac{\pi}{3}, \frac{5\pi}{3}$ $x = \pi$

24. $3\tan^3 x = \tan x$

$3\tan^3 x - \tan x = 0$

$\tan x(3\tan^2 x - 1) = 0$

$\tan x = 0$ $3\tan^2 x = 1$

$\tan^2 x = \frac{1}{3}$

$\tan x = \pm\frac{1}{\sqrt{3}}$

$\tan x = \pm\frac{\sqrt{3}}{3}$

$x = \pi/6, 5\pi/6, 7\pi/6, 11\pi/6$

$x = 0, \pi$