

Solving Trigonometric Equations HOMEWORK

Decimals

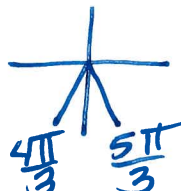
Ext. Solns

Name: checku/cale.


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Solve the following equation on the interval $0 \leq x \leq 2\pi$.

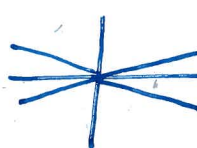
1. $\sqrt{3} \csc x + 2 = 0$
 $\sqrt{3} \csc x = -2$
 $\csc x = \frac{-2}{\sqrt{3}}$
 $\sin x = -\frac{\sqrt{3}}{2}$
 $x = \frac{4\pi}{3}, \frac{5\pi}{3}$




2. $3 \tan x - \sqrt{3} = 0$
 $\tan x = \frac{\sqrt{3}}{3}$
 $x = \frac{\pi}{6}, \frac{7\pi}{6}$



3. $4 \cos^2 x - 3 = 0$
 $\sqrt{\cos^2 x} = \sqrt{\frac{3}{4}}$
 $\cos x = \pm \frac{\sqrt{3}}{2}$
 $x = \frac{\pi}{6}, \frac{5\pi}{6}, \frac{7\pi}{6}, \frac{11\pi}{6}$




4. $2 \sin^2 x - 1 = 0$
 $\sqrt{\sin^2 x} = \sqrt{\frac{1}{2}}$
 $\sin x = \pm \frac{\sqrt{1}}{\sqrt{2}} \cdot \frac{\sqrt{2}}{\sqrt{2}}$
 $\sin x = \pm \frac{\sqrt{2}}{2}$
 $x = \frac{\pi}{4}, \frac{3\pi}{4}, \frac{5\pi}{4}, \frac{7\pi}{4}$




5. $\sin x \cos x = 3 \cos x$
 $\sin x \cos x - 3 \cos x = 0$
 $\cos x (\sin x - 3) = 0$
 $\cos x = 0$ $\sin x - 3 = 0$
 $\sin x = 3$
 $x = \frac{\pi}{2}, \frac{3\pi}{2}$

6. $2 \tan^4 x - \tan^2 x - 15 = 0$
 $(2 \tan^2 x + 5)(\tan^2 x - 3) = 0$
 $2 \tan^2 x + 5 = 0$ $\tan^2 x - 3 = 0$
 $\tan^2 x = -\frac{5}{2}$ $\tan^2 x = 3$
 $\tan x = \pm \sqrt{-\frac{5}{2}}$ $\tan x = \pm \sqrt{3}$
 $x = \frac{\pi}{3}, \frac{2\pi}{3}, \frac{4\pi}{3}, \frac{5\pi}{3}$



7. $\sqrt{\cos x}^2 = (2 \cos x - 1)^2$
 $\cos x = 4 \cos^2 x - 4 \cos x + 1$

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



$0 = 4 \cos^2 x - 5 \cos x + 1$
 $0 = (4 \cos x - 1)(\cos x - 1)$
 $4 \cos x - 1 = 0$ $\cos x = 1$
 $\cos x = \frac{1}{4}$ $x = 0$

$x = \frac{\pi}{4}, \frac{3\pi}{4}, 1.107, 4.249$

 ext.

Find the general solutions to the following trigonometric equations.

9. $\sin \alpha + \sqrt{2} = -\sin \alpha$

$2\sin \alpha + \sqrt{2} = 0$
 $\sin \alpha = -\frac{\sqrt{2}}{2}$



$\alpha = \frac{5\pi}{4} + 2\pi k, \frac{7\pi}{4} + 2\pi k$

10. $3\tan^2 \theta - 9 = 0$

$\tan^2 \theta = 3$
 $\tan \theta = \pm\sqrt{3}$



$\theta = \frac{\pi}{3} + \pi k, \frac{2\pi}{3} + \pi k$

11. $4\cos^2 x - 1 = 0$

$\cos^2 x = \frac{1}{4}$
 $\cos x = \pm\sqrt{\frac{1}{4}}$
 $\cos x = \pm\frac{1}{2}$



$x = \frac{\pi}{3} + \pi k, \frac{2\pi}{3} + \pi k$

12. $\sqrt{3}\cos x \tan x - \cos x = 0$

$\cos x (\sqrt{3}\tan x - 1) = 0$
 $\cos x = 0$ $\sqrt{3}\tan x - 1 = 0$
 $\tan x = \frac{1}{\sqrt{3}}$
 $\tan x = \frac{\sqrt{3}}{3}$

$x = \frac{\pi}{2} + \pi k, \frac{\pi}{6} + \pi k$

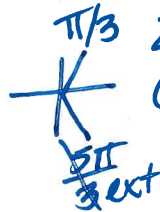
13. $2\sin^3 \theta = \sin \theta$

$2\sin^3 \theta - \sin \theta = 0$
 $\sin \theta (2\sin^2 \theta - 1) = 0$



$\sin \theta = 0$ $2\sin^2 \theta - 1 = 0$
 $\sqrt{\sin^2 \theta} = \sqrt{\frac{1}{2}}$
 $\sin \theta = \pm\frac{\sqrt{2}}{2}$
 $\sin \theta = \pm\frac{\sqrt{2}}{2}$

$\theta = 0 + \pi k,$
 $\frac{\pi}{4} + \frac{\pi}{2} k$



14. $(1 + \cos \beta)^2 = (\sqrt{3}\sin \beta)^2$

$1 + 2\cos \beta + \cos^2 \beta = 3\sin^2 \beta$
 $1 + 2\cos \beta + \cos^2 \beta = 3(1 - \cos^2 \beta)$
 $1 + 2\cos \beta + \cos^2 \beta = 3 - 3\cos^2 \beta$
 $4\cos^2 \beta + 2\cos \beta - 2 = 0$
 $2\cos^2 \beta + \cos \beta - 1 = 0$
 $(2\cos \beta - 1)(\cos \beta + 1) = 0$
 $\cos \beta = \frac{1}{2}$ $\cos \beta = -1$
 $\beta = \frac{\pi}{3} + 2\pi k$ $\beta = \pi + 2\pi k$

15. $2\sin^2 x - \cos x - 1 = 0$

$2(1 - \cos^2 x) - \cos x - 1 = 0$
 $2 - 2\cos^2 x - \cos x - 1 = 0$
 $-2\cos^2 x - \cos x + 1 = 0$
 $2\cos^2 x + \cos x - 1 = 0$
 $(2\cos x - 1)(\cos x + 1) = 0$
 $\cos x = \frac{1}{2}$ $\cos x = -1$



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

16. $\sin^2 \theta + 5\sin \theta = 3$

$\sin^2 \theta + 5\sin \theta - 3 = 0$
 $\sin \theta = \frac{-5 \pm \sqrt{(-5)^2 - 4(1)(-3)}}{2(1)}$
 $\sin \theta = \frac{-5 \pm \sqrt{37}}{2} \approx 0.541, -5.541$
 $\theta = \sin^{-1}(0.541)$
 $\theta \approx 0.572$
 $\theta \approx \pi - 0.572$



$\theta \approx 0.572, 2.570$

9. $\frac{5\pi}{4} + 2\pi k, \frac{7\pi}{4} + 2\pi k$	10. $\frac{\pi}{3} + \pi k, \frac{2\pi}{3} + \pi k$	11. $\frac{\pi}{4} + \frac{\pi}{2} k$	12. $\frac{\pi}{2} + \pi k, \frac{\pi}{6} + \pi k$	13. $0 + \pi k, \frac{\pi}{4} + \frac{\pi}{2} k$
14. $\frac{\pi}{3} + 2\pi k, \frac{5\pi}{3} + 2\pi k, \pi + 2\pi k$	15. $\frac{\pi}{3} + 2\pi k, \frac{5\pi}{3} + 2\pi k, \pi + 2\pi k$	16. $0.572 + 2\pi k, 2.570 + 2\pi k$		