4.4 Trig Equations New

Monday, October 18, 2021 10:58 AM

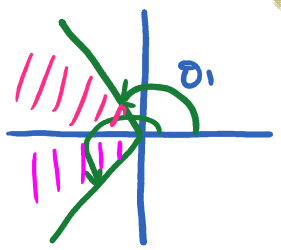
4.4 Introduction to Trig Equations

2 Students | All 1

Students	All
sin ⊕	sin ⊕
cos ⊖	cos ⊕
tan ⊖	tan ⊕
sin ⊖	sin ⊖
cos ⊖	cos ⊕
tan ⊕	tan ⊖

3 Take | Calculus 4

Ex. #1: Solve $\cos\theta = -0.437$ $0 \le \theta < 2\pi$ 3 decimal places



$\theta = \cos^{-1}(-0.437)$

$\theta_1 = 2.023$ Quad 2

$Q_2 = \pi + \text{ref}\angle$

$Q_2 = \pi + 1.119$

$Q_2 = 4.261$

$\text{ref} = \pi - 2.023$

$\text{ref}\angle = 1.119$

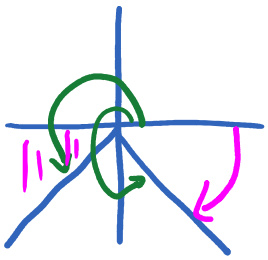
Ex. #2 Solve $-3 - 5\sin\theta = 2\sin\theta - 2$ $[0°, 360°)$ 3 decimal places

$-5\sin\theta = 2\sin\theta + 1$

$0° \le \theta < 360°$

$-7\sin\theta = 1$

$\sin\theta = -\frac{1}{7}$



$\theta = \sin^{-1}\left(-\frac{1}{7}\right)$

$\theta = -8.213°$

$\therefore \text{ref}\angle = 8.213°$

Quad 3

$\theta_1 = 180° + 8.213°$

$\theta_1 = 188.213°$

Quad 4

$\theta_2 = 360° - 8.213°$

$\theta_2 = 351.787°$

Ex. #3: Solve using exact values $2\sec\theta = 4 \qquad 0 \le \theta < 2\pi$

Special Δ

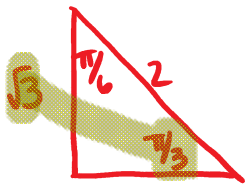
$2\sec\theta = 4$

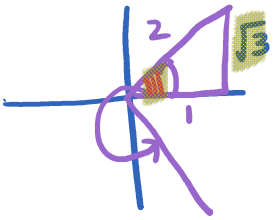
$\sec\theta = \frac{4}{2}$

$\sec\theta = \frac{2}{1}$

$\cos\theta = \frac{1}{2}$ $x=1$ $r=2$

$\cos\theta = \frac{x}{r}$





ref $\angle = \frac{\pi}{3}$

θ_1 Quad 1

$\theta_1 = \frac{\pi}{3}$

Quad 4

$\theta_2 = 2\pi - \frac{\pi}{3}$

$\theta_2 = \frac{6\pi}{3} - \frac{\pi}{3}$

$\theta_2 = 5\pi/3$

Ex. #4: Solve using exact values $3 + 5\csc\theta = 1 + 4\csc\theta$ $-\pi \le \theta < \pi$

$3 + 5\csc\theta = 1 + 4\csc\theta$

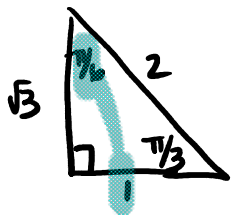
$5\csc\theta = -2 + 4\csc\theta$

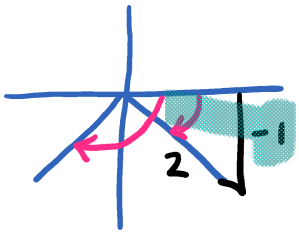
$1\csc\theta = -2$

$\csc\theta = -\frac{2}{1}$

$\sin\theta = -\frac{1}{2}$ $y=-1$ $r=2$

$\sin\theta = \frac{y}{r}$





ref $\angle = \frac{\pi}{6}$

Quad 4

$\theta_1 = -\frac{\pi}{6}$

Quad 3

$\theta_2 = -\left[\pi - \frac{\pi}{6}\right]$

$\theta_2 = -\left[\frac{6\pi}{6} - \frac{\pi}{6}\right]$

$\theta_2 = -\frac{5\pi}{6}$

Ex. #5: Solve using exact values $4sin^2\theta = 3$ $[0°, 360°)$

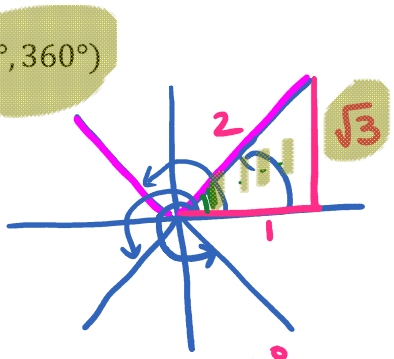
$4\sin^2\theta = 3$

$\sin^2\theta = \frac{3}{4}$

don't forget the ±

$\sin\theta = \pm\frac{\sqrt{3}}{\sqrt{4}}$

$\sin\theta = \pm\frac{\sqrt{3}}{2}$ $y=\sqrt{3}$ $r=2$



ref = 60°

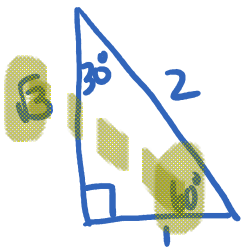
Quad 1
$\theta_1 = 60°$

Quad 2
$\theta_2 = 180° - 60°$
$\theta_2 = 120°$

Quad 3
$\theta_3 = 180° + 60°$
$\theta_3 = 240°$

Quad 4
$\theta_4 = 360° - 60°$
$\theta_4 = 300°$

$\sin\theta = \frac{y}{r}$

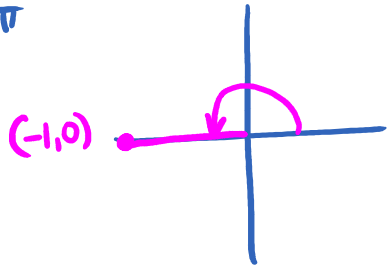


Ex. #6: Find a general solution in radians using exact values $\cos\theta + 1 = 0$

Find solutions for $0 \le \theta < 2\pi$

$\cos\theta + 1 = 0$

$\cos\theta = \frac{-1}{1}$ $x=-1$ $r=1$



$\theta_1 = \pi$

$\cos\theta = \frac{x}{r}$

General solutions means make a coterminal formula

$\theta = \pi + 2\pi n \quad n \in I$

or

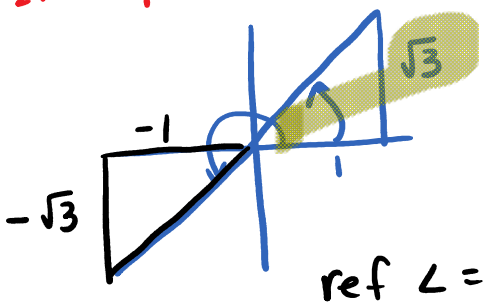
$\theta = \pi(1 + 2n) \quad n \in I$

Ex. #7: Find a general solution in radians using exact values $\tan\theta - \sqrt{3} = 0$

formula $0 \le \theta < 2\pi$ Special Δ

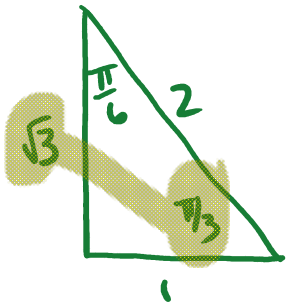
$\tan\theta - \sqrt{3} = 0$

$\tan\theta = \frac{\sqrt{3}}{1}$ $y = \sqrt{3}$ $x = 1$



ref $\angle = \frac{\pi}{3}$

$\tan\theta = \frac{y}{x}$



Quad 1

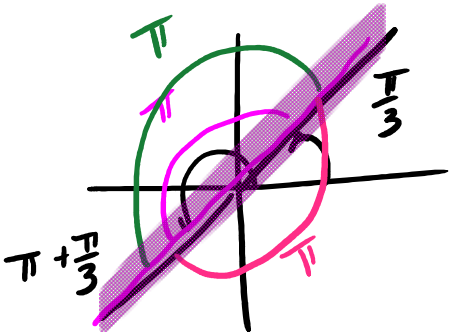
$\theta = \frac{\pi}{3}$

Quad 3

$\theta = \pi + \frac{\pi}{3}$

$\theta = \frac{3\pi}{3} + \frac{\pi}{3}$

$\theta = \frac{4\pi}{3}$



General Solution

$\left.\begin{aligned}\theta &= \frac{\pi}{3} + 2\pi n \\ \theta &= \frac{4\pi}{3} + 2\pi n\end{aligned}\right\}\ n \in I$

or

$\theta = \frac{\pi}{3} + \pi n \quad n \in I$