

Trig 7.2 Trigonometric Equations

Sin/cos has two solutions

Step 1 - determine which 2 Quadrants the solution angle might be

Step 2 - in each possible quadrant, find the corresponding reference angle

Step 3 - from given trig function value, we can get what θ_r is equal to

Step 4 - get two solution angles

EX let $0 \leq \theta \leq 2\pi$ $\sin \theta = \frac{1}{2}$ what is θ ?

Since $\sin \theta = \frac{1}{2}$ is positive, so angles must be QI & QII

if in QI, $\sin \theta = \frac{1}{2}$ $\theta_1 = 30^\circ$

if in QII, $\sin \theta = \frac{1}{2}$ $\theta_2 = 180^\circ - 30^\circ = 150^\circ$



EX Solve $\cos \theta = -\frac{1}{2}$ $0 \leq \theta \leq 2\pi$

QII $\theta_1 = 180^\circ - 60^\circ = 120^\circ$

QIII $\theta_2 = 180^\circ + 60^\circ = 240^\circ$



EX solve $\sin \alpha = -\frac{\sqrt{2}}{2}$ $0 \leq \alpha \leq 2\pi$

QIII $\alpha_1 = 180^\circ + 45^\circ = 225^\circ$

QIV $\alpha_2 = 360^\circ - 45^\circ = 315^\circ$



How to solve when not given ($0 \leq \theta \leq 2\pi$)

1) solve and get 2 solution angles θ_1, θ_2

2) the final solutions are $(\theta_1 + n \cdot 360^\circ)$ & $(\theta_2 + n \cdot 360^\circ)$

$(\theta_1 + 2\pi n)$ & $(\theta_2 + 2\pi n)$

Solve $\cos \beta = \frac{\sqrt{3}}{2}$

$\beta_1 = 30^\circ$

$\beta_2 = 360^\circ - 30^\circ = 330^\circ$

$30^\circ + 360^\circ n$

$330^\circ + 360^\circ n$



Trig 7.2

Tan has one solution

step 1 - Find one solution in $[0, \pi]$

step 2 - Solution $\theta, + n \cdot \pi$ or $\theta, + n \cdot 180^\circ$

EX $\tan \theta = 1$

$\tan \theta_1 = 1 \quad \theta_1 = 45^\circ \quad | \quad \theta_1 = 45^\circ + n \cdot 180^\circ |$

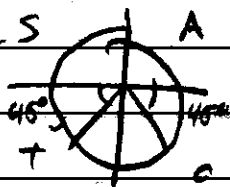


EX $\cot \beta = -\sqrt{3}$

$180^\circ - 30^\circ = 150^\circ \quad | \quad \beta_1 = 150^\circ + n \cdot 180^\circ |$



Solve $\sin^2 \theta - \frac{1}{2} = 0 \quad (\sin \theta + \frac{1}{\sqrt{2}})(\sin \theta - \frac{1}{\sqrt{2}}) = 0$



$\sin \theta = -\frac{1}{\sqrt{2}} \quad \sin \theta = \frac{1}{\sqrt{2}}$

$\sin \theta = -\frac{\sqrt{2}}{2} \quad \sin \theta = \frac{\sqrt{2}}{2}$

$\theta_1 = 180^\circ + 45^\circ = 225^\circ$

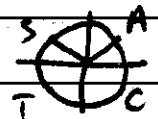
$\theta_1 = 45^\circ$

$\theta_2 = 360^\circ - 45^\circ = 315^\circ$

$\theta_2 = 180^\circ - 45^\circ = 135^\circ$

$\theta = 225^\circ + 360^\circ n \ \& \ 315^\circ + 360^\circ n$

$\theta = 45^\circ + 360^\circ n \ \& \ 135^\circ + 360^\circ n$



Solve $(\sin \theta + \cos \theta)(\cos \theta - \frac{1}{2}) = 0$ (already factored)

$\sin \theta + \cos \theta = 0$

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

$\frac{\sin \theta}{\cos \theta} + \frac{\cos \theta}{\cos \theta} = \frac{0}{\cos \theta}$

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

$\tan \theta + 1 = 0$

$\theta_1 = 60^\circ$

$\tan \theta = -1$

$\theta_2 = 360^\circ - 60^\circ = 300^\circ$

$\theta = 180^\circ - 45^\circ = 135^\circ$

$\theta = 60^\circ + 360^\circ n \ \& \ 300^\circ + 360^\circ n$

$\theta = 135^\circ + 180^\circ n$



tan theta = 1

