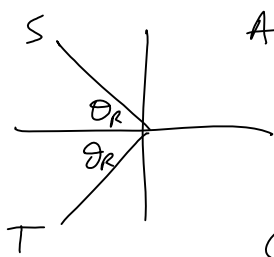


Unit 4: Trigonometry & The Unit Circle

4.4 Introduction to Trigonometric Equations

ex. Solve to the nearest tenth: $3 \sec \theta + 5 = 0$; $0 \leq \theta < 360^\circ \leftarrow \text{degrees!}$



$$\sec \theta = -5/3$$

$$\therefore \cos \theta = -3/5$$

$$\theta \text{ II + III}$$

$$\theta_R = \cos^{-1}(3/5) = 53.1^\circ$$

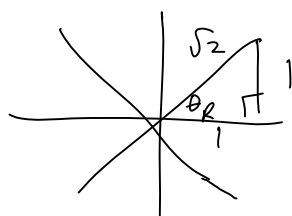
$$180 - 53.1 \quad 180 + 53.1$$

$$\theta = 126.9^\circ, 233.1^\circ$$

check

$$\frac{3}{\cos 126.9} + 5 \stackrel{?}{=} 0$$

ex. Find the exact solutions: $2 \sin^2 \theta - 1 = 0$; $0 \leq \theta < 2\pi$



$$\sin^2 \theta = 1/2$$

$$\sin \theta = \pm 1/\sqrt{2}$$

all quadrants!

$$\theta_R = \pi/4$$

rad!

$$* \sin^2 \theta = (\sin \theta)^2 \neq \sin \theta^2$$

$$\pi - \pi/4 \quad \pi + \pi/4 \quad 2\pi - \pi/4$$

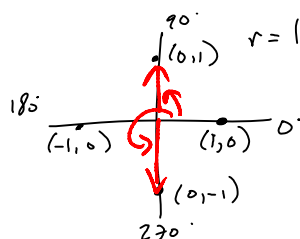
$$\theta = \pi/4, 3\pi/4, 5\pi/4, 7\pi/4$$

ex. Solve, state exact solutions: $\cos^2 \theta - \cos \theta = 0$; $0 \leq \theta < 360^\circ$

$$x^2 - x = 0$$

$$x(x-1) = 0$$

$$x = 0 \quad x = 1$$



$$\cos \theta = 0$$

$$\frac{x}{1} = 0$$

$$x = 0$$

$$\cos \theta = 1$$

$$\frac{x}{1} = 1$$

$$x = 1$$

$$\theta = 90^\circ, 270^\circ \quad \theta = 0^\circ$$

State the general solutions:

$\hookrightarrow$ all possible θ 's * all coterminals

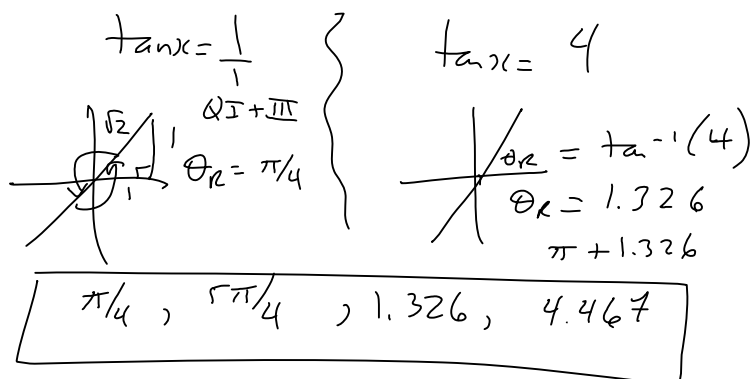
$$\left. \begin{array}{l} \theta = 90^\circ + 360^\circ n \\ \theta = 270^\circ + 360^\circ n \\ \theta = 0^\circ + 360^\circ n \end{array} \right\} n \in \mathbb{I} \rightarrow \left. \begin{array}{l} \theta = 90^\circ + 180^\circ n \\ \theta = 360^\circ n \end{array} \right\} n \in \mathbb{I}$$

ex. Solve, state exact solutions where possible. Otherwise, approximate to the nearest thousandth:
 $\tan^2 x - 5 \tan x + 4 = 0; 0 \leq x < 2\pi$

$$y^2 - 5y + 4 = 0$$

$$(y-1)(y-4) = 0$$

$$y = 1 \quad y = 4$$



State the general solutions:

$$\begin{aligned} \theta &= \pi/4 + 2\pi n \\ \theta &= 5\pi/4 + 2\pi n \\ \theta &= 1.326 + 2\pi n; n \in \mathbb{I} \\ \theta &= 4.467 + 2\pi n \end{aligned}$$

$$\begin{aligned} \theta &= \pi/4 + \pi n \\ \theta &= 1.326 + \pi n; n \in \mathbb{I} \end{aligned}$$

ex. Solve, state exact general radian solutions: $3 \csc^2 x - 2 = 5 \csc x$

$$3b^2 - 2 = 5b$$

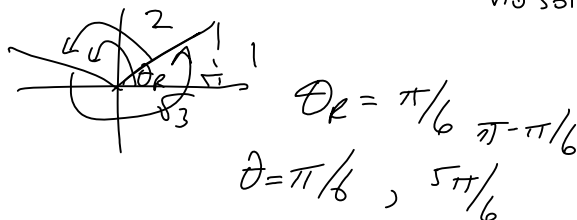
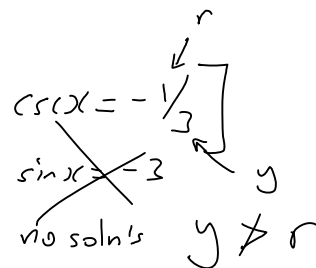
$$3b^2 - 5b - 2 = 0$$

$$(3b+1)(b-2) = 0$$

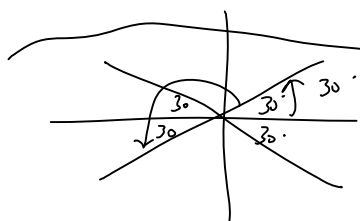
$$b = 2 \quad b = -1/3$$

$$\csc x = 2$$

$$\sin x = 1/2$$



$$\begin{aligned} \theta &= \pi/6 + 2\pi n \\ \theta &= 5\pi/6 + 2\pi n; n \in \mathbb{I} \end{aligned}$$



$$\begin{aligned} 30^\circ + 180^\circ n \\ 150^\circ + 180^\circ n \end{aligned}$$

