

Trig 6.4 Values of the Trig Functions

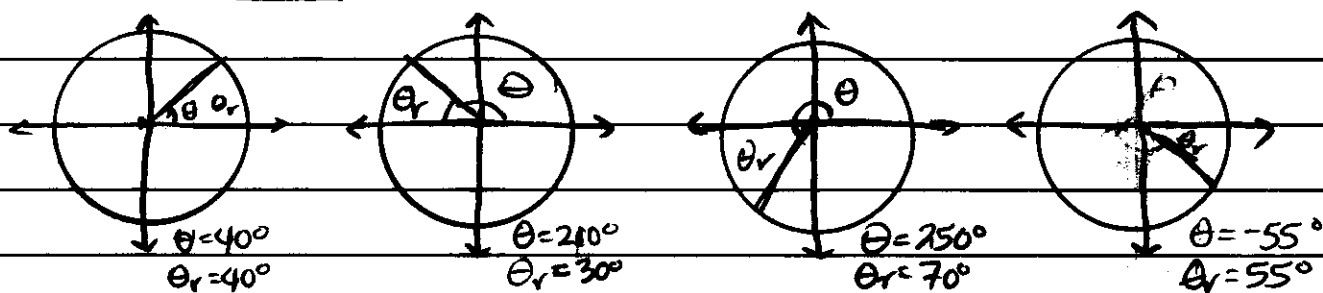
Reference Angle

- ① Def & how to find it
- ② It's Application

Definition - Let θ be an angle in standard position
 the reference angle for θ is the acute angle θ_r
 that the terminal side of θ makes with the x-axis.
 $0 < \theta_r < 90^\circ$

Note: θ_r is always positive & less than 90°

Given an angle, there is a unique reference angle for it
How To Find It



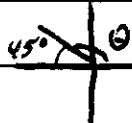
How to find θ_r , given θ

Step 1 - Draw θ in x-y plane

Step 2 - Find an acute angle between terminal side of θ & x-axis, this is θ_r

Find θ_r EX 1 $\theta = 135^\circ$

$$\theta_r = 45^\circ$$



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

EX 2 $\theta = 200^\circ$

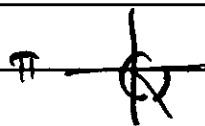
$$\theta_r = 20^\circ$$



$$200^\circ - 180^\circ = 20^\circ$$

EX 3 $\theta = \frac{5\pi}{3}$

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

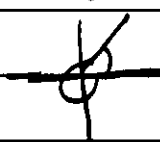


$$\frac{5\pi}{3} \times \frac{180^\circ}{\pi} = 300^\circ \quad 60^\circ \cdot \frac{\pi}{180} = \frac{\pi}{3}$$

$$\text{or } 2\pi - \frac{5\pi}{3} = \frac{\pi}{3}$$

EX 4 $\theta = -\frac{7\pi}{4}$

$$\theta_r = \frac{\pi}{4}$$



$$2\pi - \frac{7\pi}{4} = \frac{\pi}{4}$$

Trig 6.4

Applications

Theorem: To find the value of the trig functions at an angle θ find the value of the function at the reference angle for the angle & then put the appropriate sign for the function

Steps to find a value of trig function of θ

Step 1 Draw θ

Step 2 Find θ_r

Step 3 Determine sign of trig function in current Quadrant

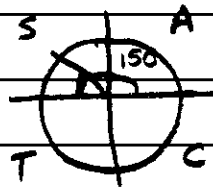
Step 4 Trig func (θ) = sign same trig func θ_r

Ex Find $\cos 150^\circ$

$$\theta = 150^\circ$$

$$\theta_r = 30^\circ$$

$$\cos 150^\circ = -\cos 30^\circ = -\frac{\sqrt{3}}{2}$$

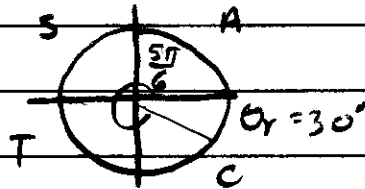


$$\tan \frac{5\pi}{6}$$

$$\theta = \frac{5\pi}{6}$$

$$\theta_r = 30^\circ$$

$$\tan \left(\frac{5\pi}{6} \right) = -\tan 30^\circ = -\frac{\sqrt{3}}{3}$$

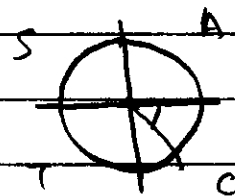


$$\cot \left(-\frac{\pi}{3} \right)$$

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

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

$$\cot \left(-\frac{\pi}{3} \right) = -\cot \frac{\pi}{3} = -\sqrt{3}$$



$$\sec(-30^\circ)$$

$$\theta = -30^\circ, \theta_r = 30^\circ$$

$$\sec(-30^\circ) = +\sec 30^\circ = \frac{2}{\sqrt{3}} = \frac{2\sqrt{3}}{3}$$

