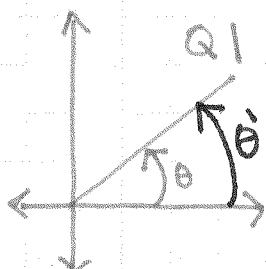


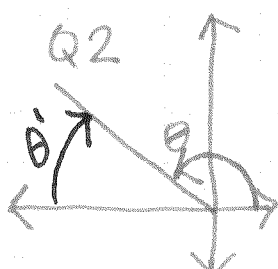
4.3 Reference Angles

A reference angle (θ' "theta prime") is an acute angle, measured from the x-axis, that can be used to find trig functions for angle θ .

always touches the x-axis

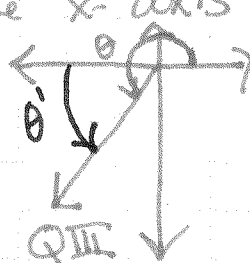


$$\theta' = \theta$$



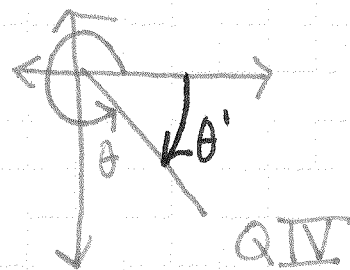
$$\theta' = 180^\circ - \theta$$

$$\theta' = \pi - \theta$$



$$\theta' = \theta - 180^\circ$$

$$\theta' = \theta - \pi$$



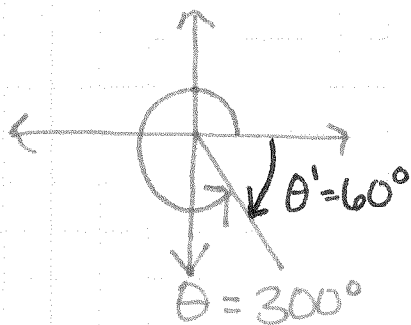
$$\theta' = 360^\circ - \theta$$

$$\theta' = 2\pi - \theta$$

θ must be $0 < \theta < 360^\circ$ or $0 < \theta < 2\pi$

Ex3: Draw the given angle, find the Ref. angle

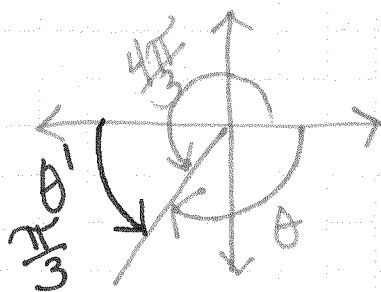
a) 300°



$$\theta' = 360^\circ - 300^\circ$$

$$\theta' = 60^\circ$$

b) $-\frac{2\pi}{3}$



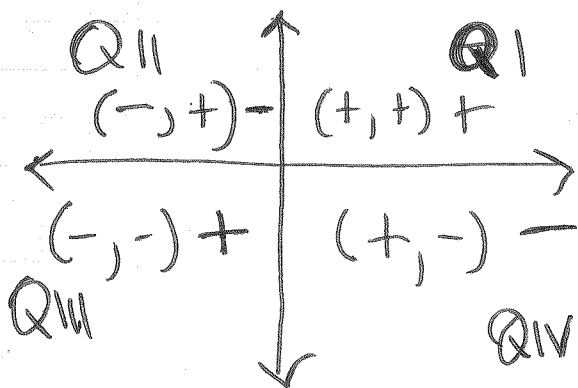
$$\theta' = \frac{4\pi}{3} - \pi = \frac{\pi}{3}$$

Coterminal angle

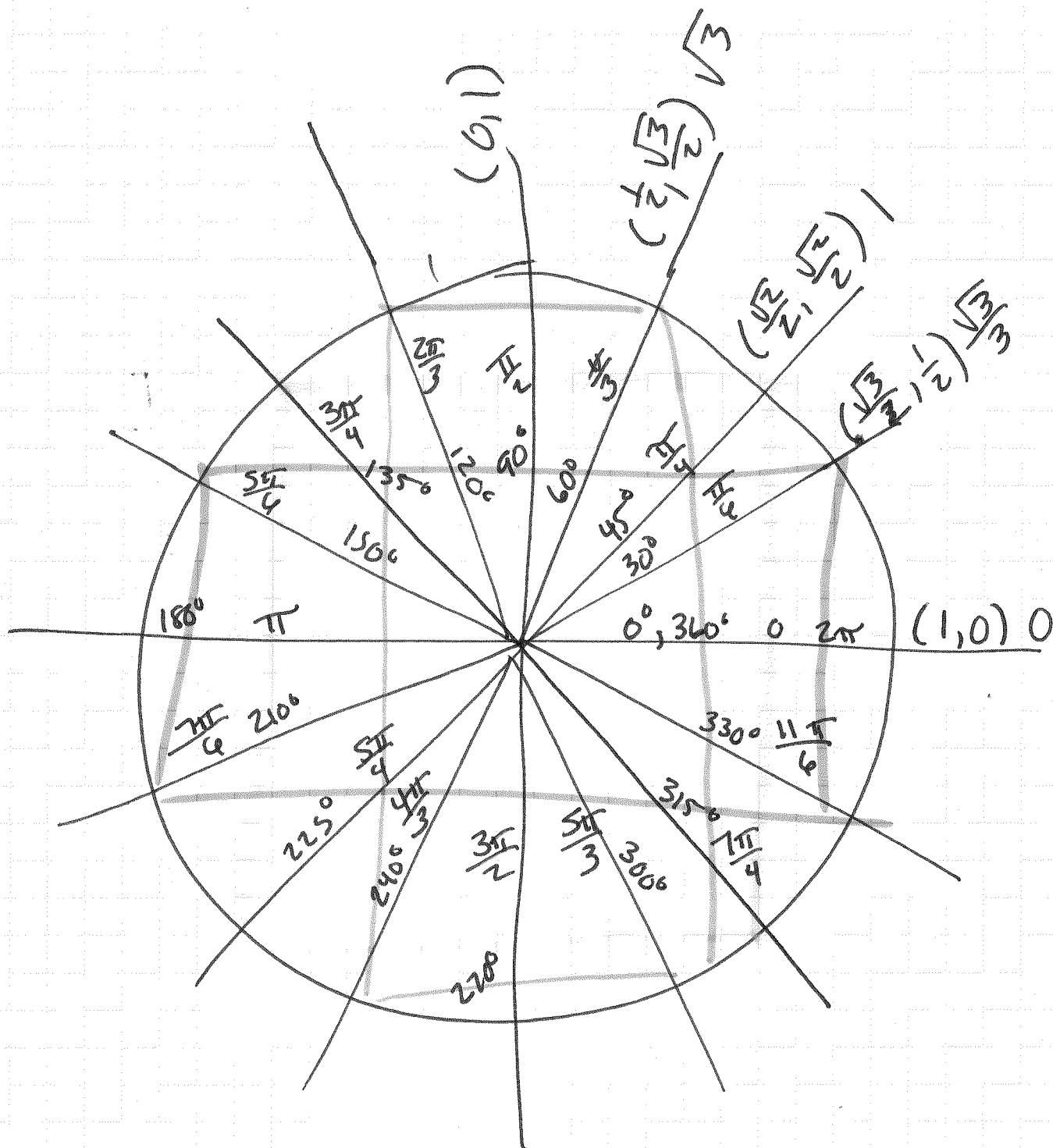
$$2\pi - \frac{2\pi}{3} = \frac{4\pi}{3}$$

Trig Functions only change sign for every quadrant.

- ① Find the coterminal angle between $0 < \theta < 360^\circ$ or $0 < \theta < 2\pi$ if necessary
- ② Find reference angle θ'
- ③ Determine trig function(s) for θ'
- ④ Determine the signs of θ based on the quadrant.



(x, y) —
 (\cos, \sin) tan



deg.
rad.
cos
sin
tan

~~251~~ 251: 17-32