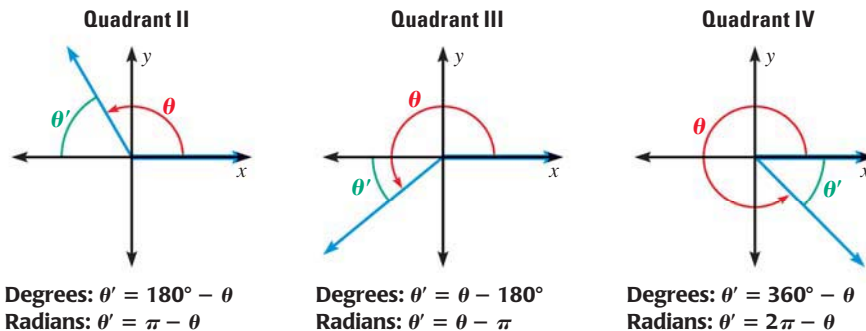


KEY CONCEPT

For Your Notebook

Reference Angle Relationships

Let θ be an angle in standard position. The **reference angle** for θ is the acute angle θ' formed by the terminal side of θ and the x -axis. The relationship between θ and θ' is shown below for nonquadrantal angles θ such that $90^\circ < \theta < 360^\circ$ ($\frac{\pi}{2} < \theta < 2\pi$).



READING

The symbol θ' is read as "theta prime."

EXAMPLE 3 Find reference angles

Find the reference angle θ' for (a) $\theta = \frac{5\pi}{3}$ and (b) $\theta = -130^\circ$.

Solution

- The terminal side of θ lies in Quadrant IV. So, $\theta' = 2\pi - \frac{5\pi}{3} = \frac{\pi}{3}$.
- Note that θ is coterminal with 230° , whose terminal side lies in Quadrant III. So, $\theta' = 230^\circ - 180^\circ = 50^\circ$.

EVALUATING TRIGONOMETRIC FUNCTIONS Reference angles allow you to evaluate a trigonometric function for any angle θ . The sign of the trigonometric function value depends on the quadrant in which θ lies.

KEY CONCEPT

For Your Notebook

Evaluating Trigonometric Functions

Use these steps to evaluate a trigonometric function for any angle θ :

- STEP 1** Find the reference angle θ' .
- STEP 2** Evaluate the trigonometric function for θ' .
- STEP 3** Determine the sign of the trigonometric function value from the quadrant in which θ lies.

Signs of Function Values	
Quadrant II	Quadrant I
$\sin \theta, \csc \theta$: +	$\sin \theta, \csc \theta$: +
$\cos \theta, \sec \theta$: -	$\cos \theta, \sec \theta$: +
$\tan \theta, \cot \theta$: -	$\tan \theta, \cot \theta$: +
Quadrant III	Quadrant IV
$\sin \theta, \csc \theta$: -	$\sin \theta, \csc \theta$: -
$\cos \theta, \sec \theta$: -	$\cos \theta, \sec \theta$: +
$\tan \theta, \cot \theta$: +	$\tan \theta, \cot \theta$: -