

HOW Reminders

• Preparedness:

- Be in the classroom when the bell rings
- Have something to write with, a calculator, and your notebook

Engagement:

- Have your phone and computer put away

Warm-Up

Factor:

$$1) 2x^2 + 5x + 3$$

$$(2x + 3)(x + 1)$$

$$2) 6x^2 + 25x + 14$$

$$(2x + 7)(3x + 2)$$

QUIZ NEXT CLASS!!!

7-1 & 7-2

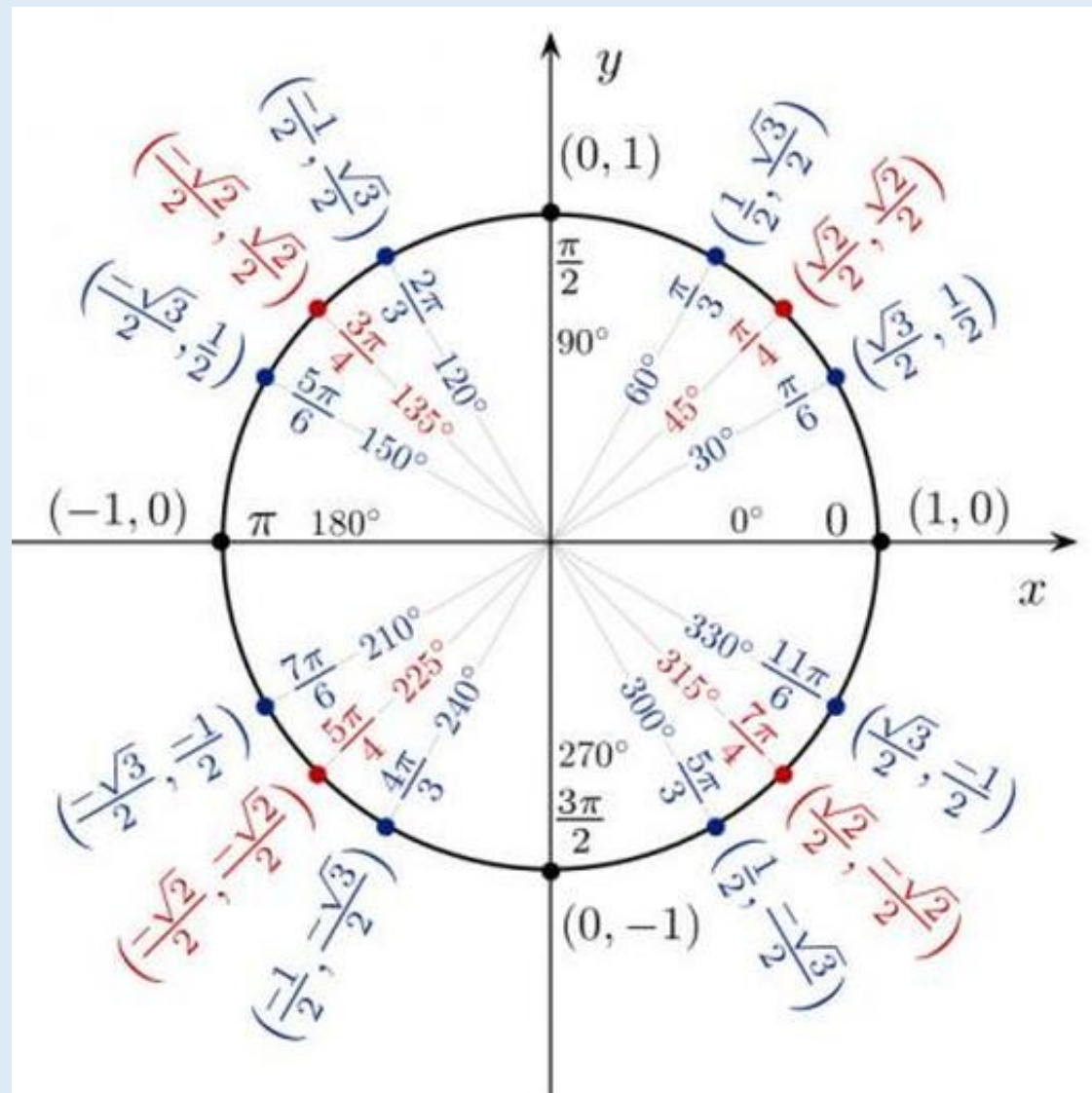
- radians \leftrightarrow degrees \leftrightarrow degrees-minutes-seconds
- arc length, sector area, & apparent size



Formulas for arc length & sector area will be given, but you have to know how to use them.

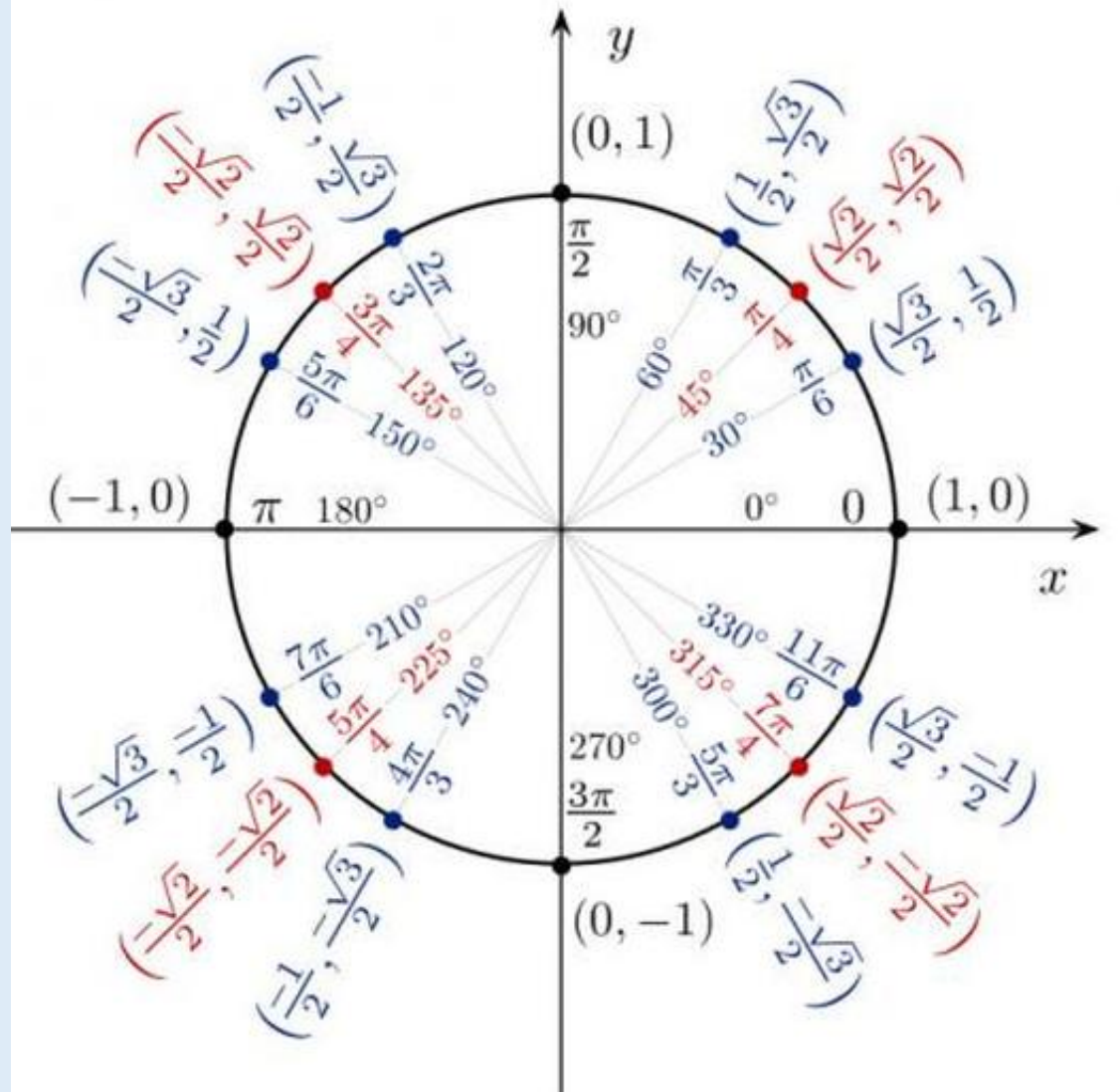
Trigonometric Functions: The Unit Circle

Chapter 7 - Trigonometry



The Unit Circle

- The *Unit Circle* is a circle on the coordinate plane whose radius is 1.
- The coordinates are given, along with the degree and radian measures of the angles created.

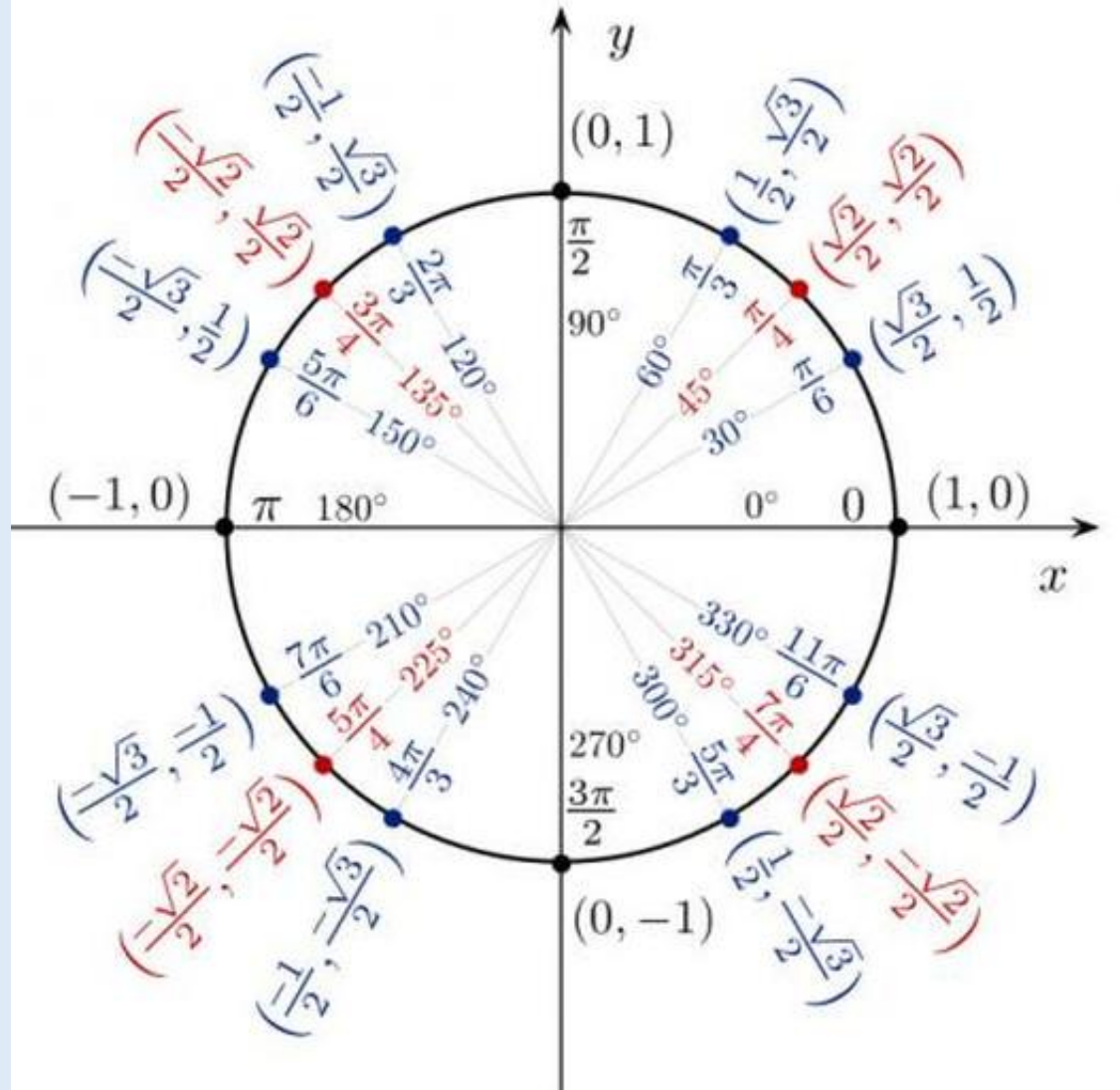


3 Major Trig Functions

$\cos \theta = x\text{-coordinate}$

$\sin \theta = y\text{-coordinate}$

$$\tan \theta = \frac{y}{x}$$



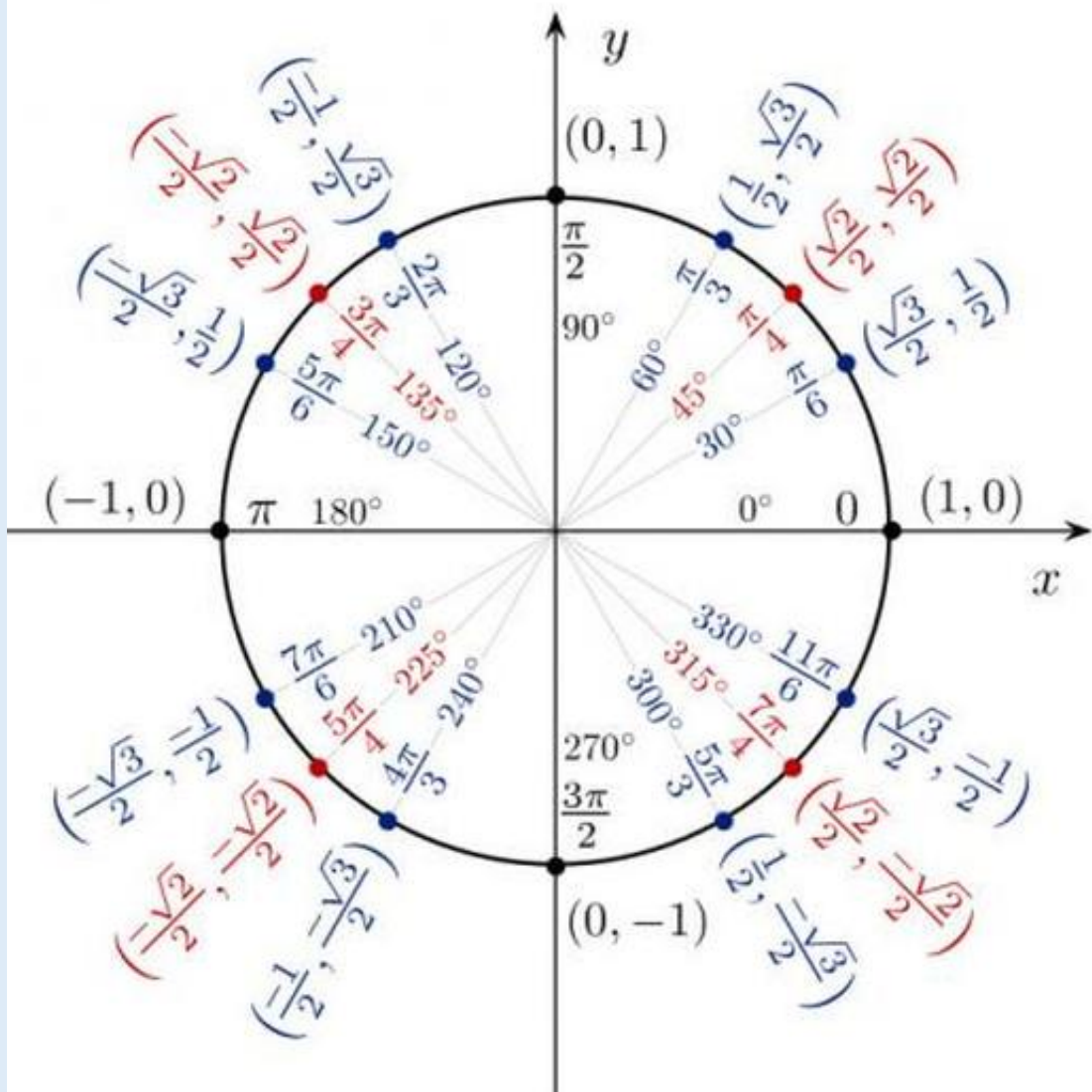
Examples

1) $\cos 30^\circ = \frac{\sqrt{3}}{2}$

2) $\sin 30^\circ = \frac{1}{2}$

3) $\cos 135^\circ = \frac{-\sqrt{2}}{2}$

4) $\sin 270^\circ = -1$



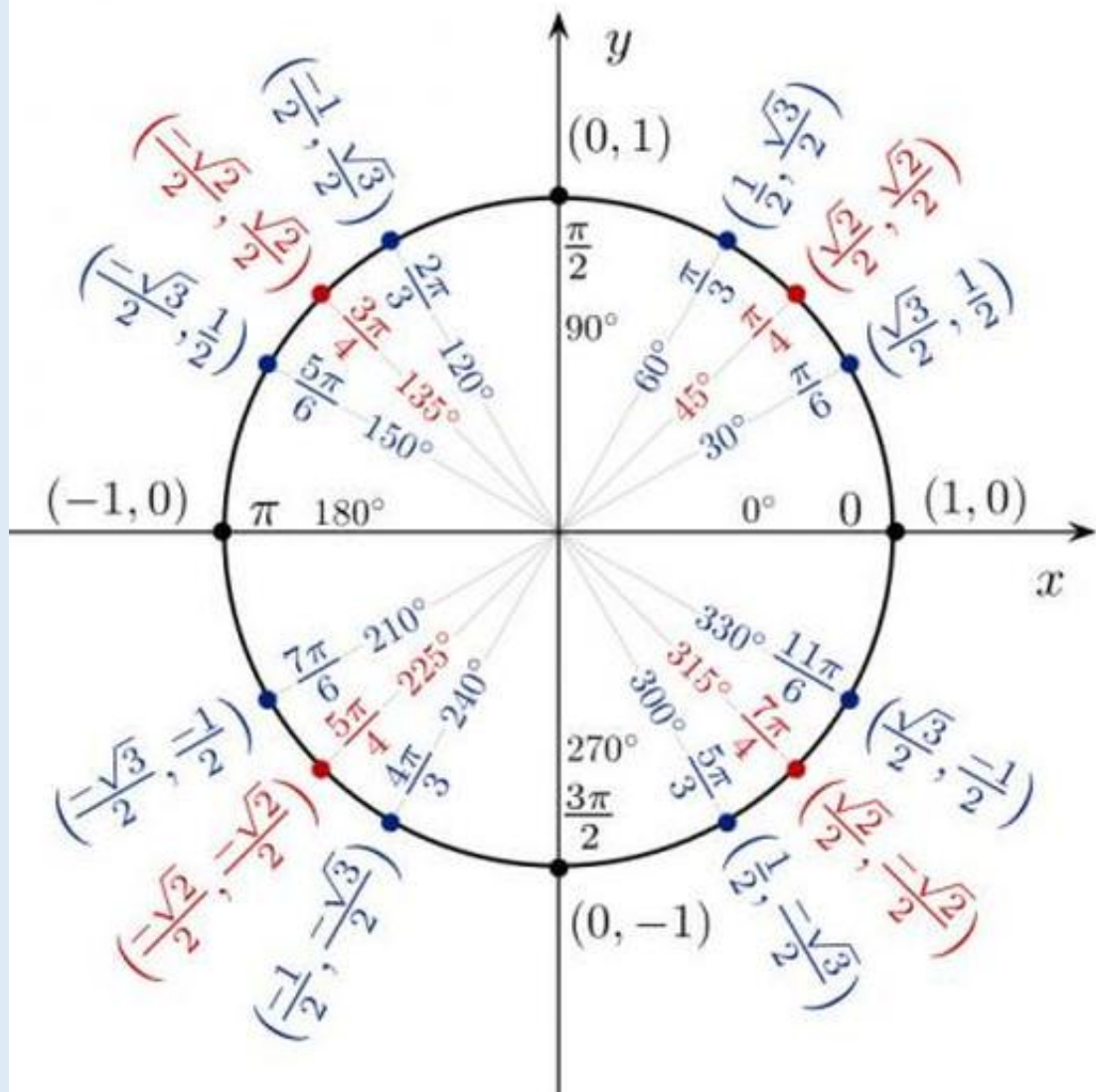
Examples

$$5) \cos \frac{2\pi}{3} = -\frac{1}{2}$$

$$6) \sin \pi = 0$$

$$7) \cos \frac{11\pi}{6} = \frac{\sqrt{3}}{2}$$

$$8) \sin \frac{5\pi}{4} = \frac{-\sqrt{2}}{2}$$

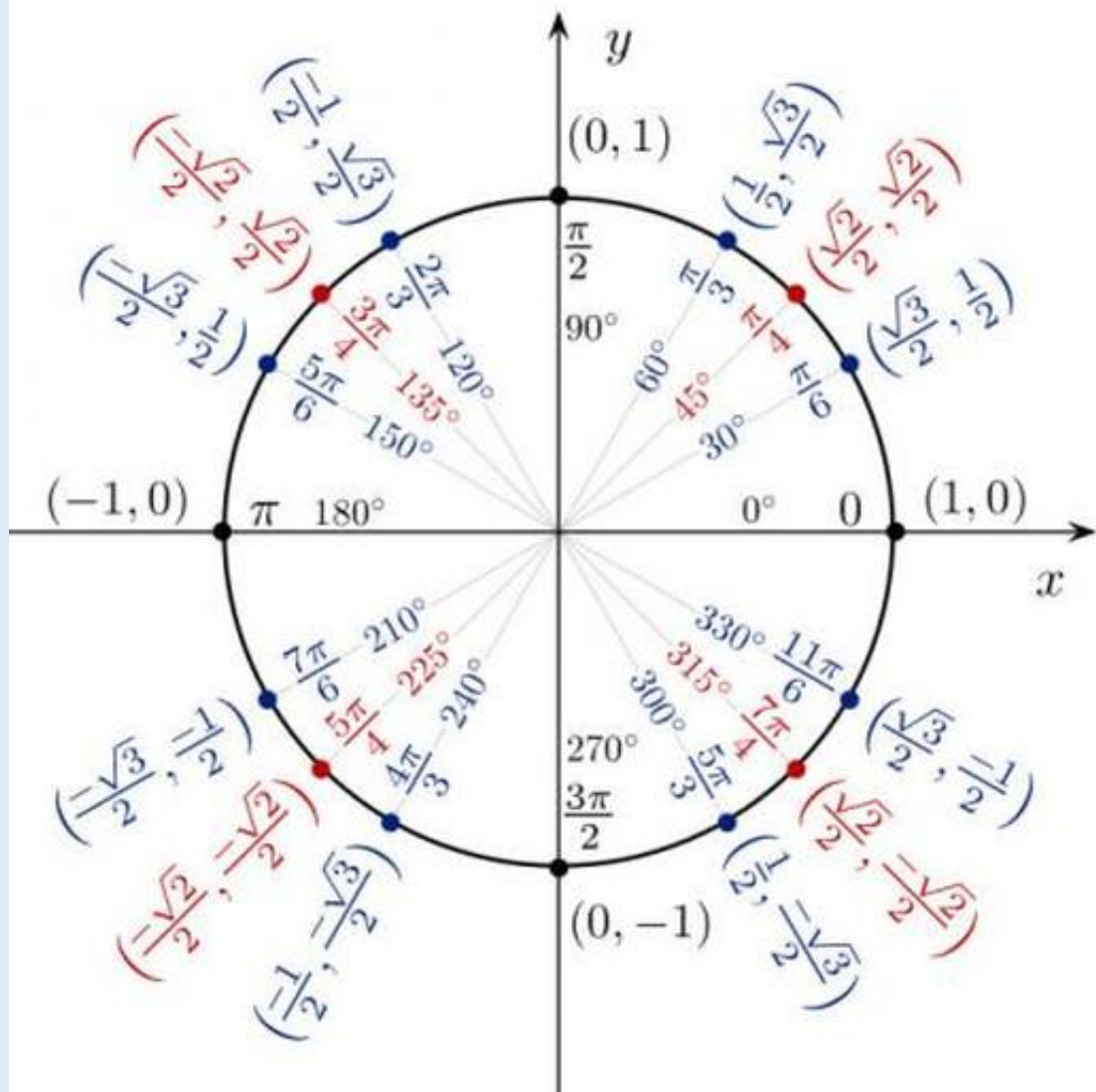


Examples

$$9) \tan 120^\circ \left(-\frac{1}{2}, \frac{\sqrt{3}}{2} \right)$$

$$\tan = \frac{y}{x} = \frac{\frac{\sqrt{3}}{2}}{-\frac{1}{2}} = \frac{\sqrt{3}}{2} \div -\frac{1}{2}$$

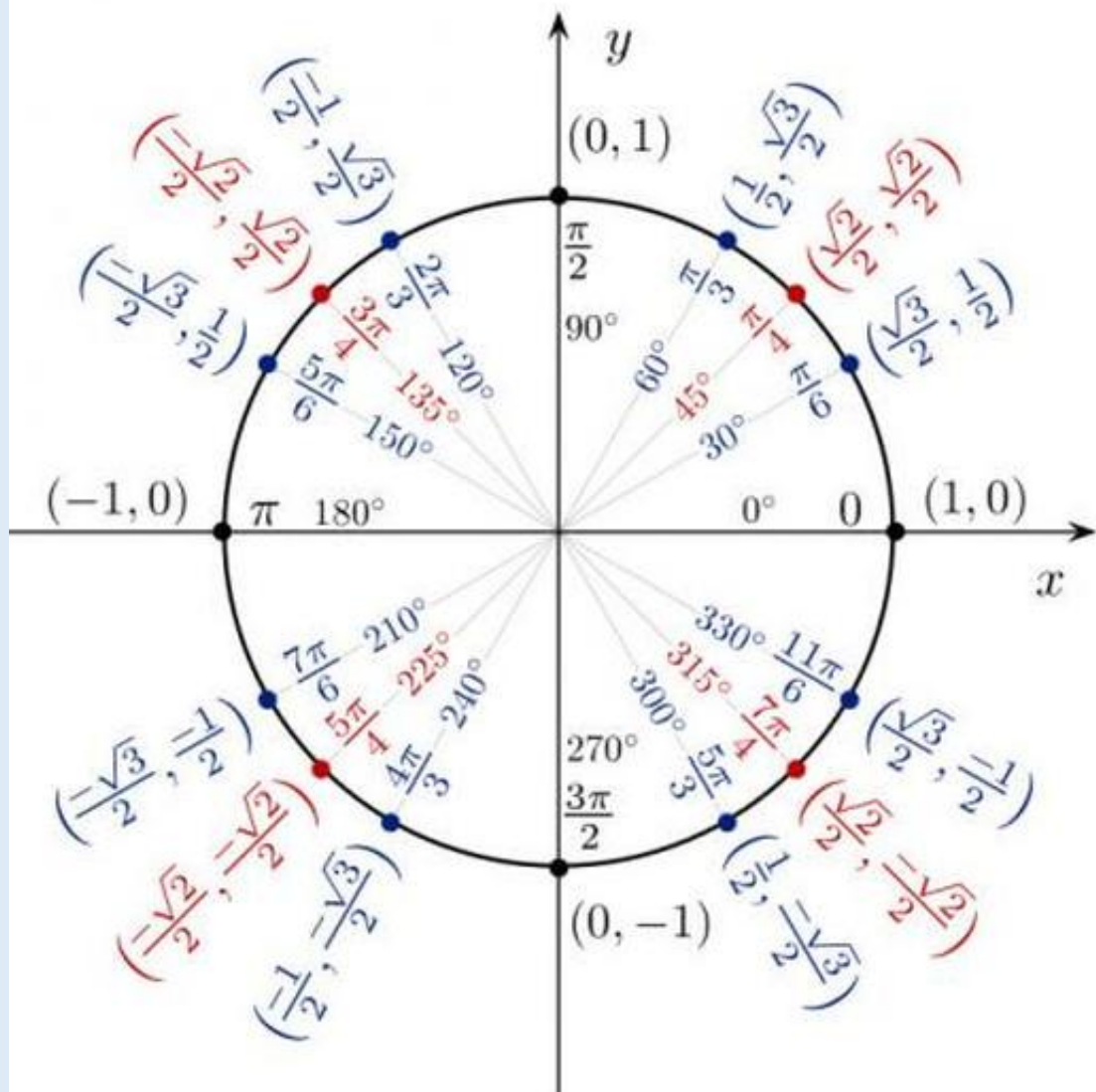
$$= \frac{\sqrt{3}}{2} \times -\frac{2}{1} = \frac{\sqrt{3}}{1} \times -\frac{1}{1} = -\sqrt{3}$$



Examples

$$10) \tan \frac{5\pi}{4} \left(-\frac{\sqrt{2}}{2}, -\frac{\sqrt{2}}{2} \right)$$

$$\tan = \frac{y}{x} = \frac{-\frac{\sqrt{2}}{2}}{-\frac{\sqrt{2}}{2}} = 1$$



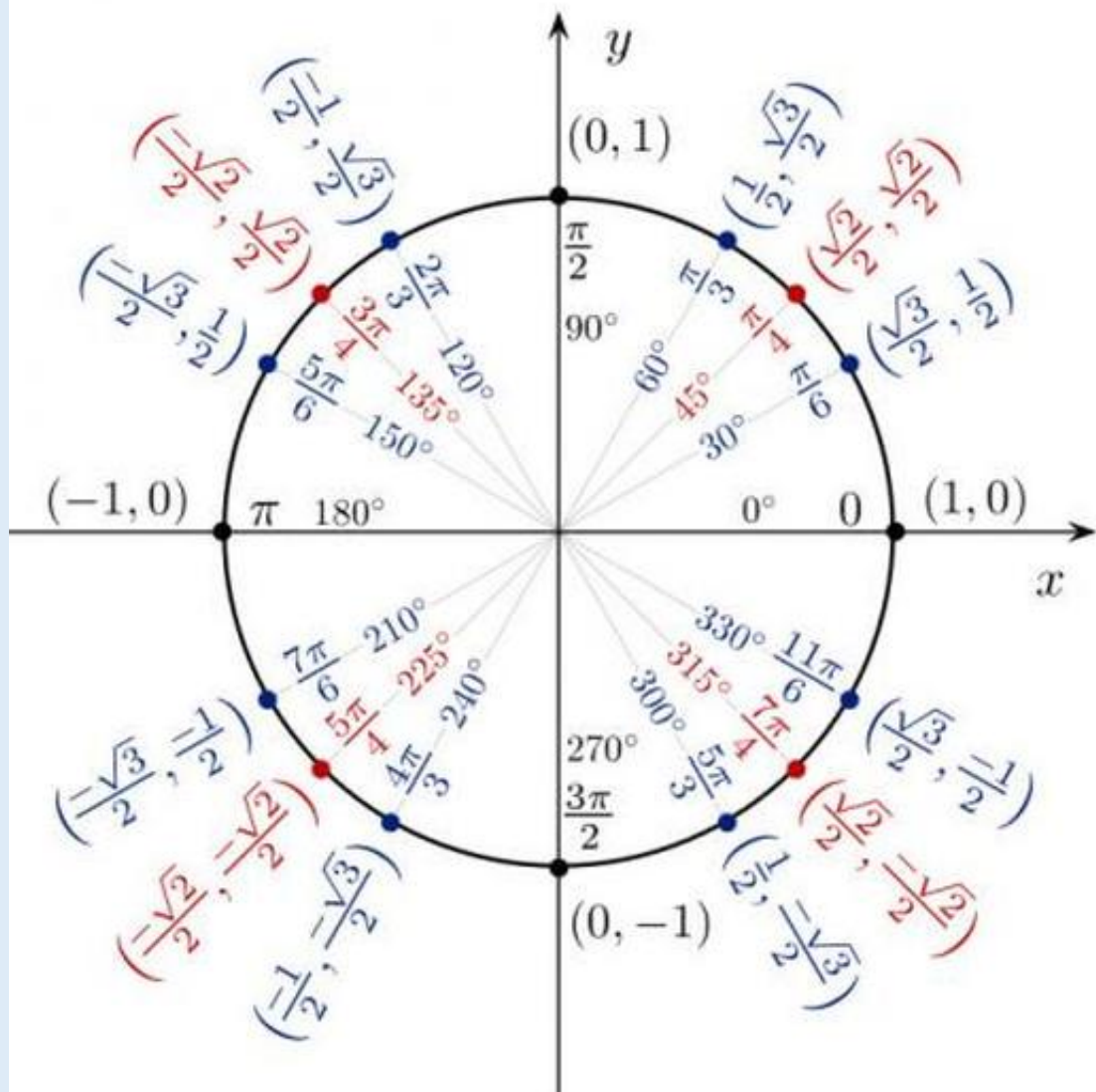
Examples

$$11) \tan \frac{\pi}{6} \quad \left(\frac{\sqrt{3}}{2}, \frac{1}{2} \right)$$

$$\tan = \frac{y}{x} = \frac{\frac{1}{2}}{\frac{\sqrt{3}}{2}} = \frac{1}{2} \div \frac{\sqrt{3}}{2}$$

$$= \frac{1}{2} \times \frac{2}{\sqrt{3}} = \frac{1}{1} \times \frac{1}{\sqrt{3}} = \frac{1}{\sqrt{3}}$$

$$\frac{1}{\sqrt{3}} \times \frac{\sqrt{3}}{\sqrt{3}} = \frac{\sqrt{3}}{\sqrt{9}} = \frac{\sqrt{3}}{3}$$



Find the exact value of each trigonometric function.

1) $\sin 30^\circ$

2) $\sin 330^\circ$

3) $\cos 90^\circ$

4) $\cos 60^\circ$

5) $\tan 120^\circ$

6) $\tan 90^\circ$

7) $\sin \frac{\pi}{3}$

8) $\sin \frac{2\pi}{3}$

9) $\cos \frac{\pi}{3}$

10) $\cos \pi$

11) $\tan \frac{4\pi}{3}$

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

Find the exact value of each trigonometric function.

1) $\sin 30^\circ$ $\frac{1}{2}$

2) $\sin 330^\circ$ $-\frac{1}{2}$

3) $\cos 90^\circ$
 0

4) $\cos 60^\circ$ $\frac{1}{2}$

5) $\tan 120^\circ$
 $-\sqrt{3}$

6) $\tan 90^\circ$
Undefined

7) $\sin \frac{\pi}{3}$ $\frac{\sqrt{3}}{2}$

8) $\sin \frac{2\pi}{3}$ $\frac{\sqrt{3}}{2}$

9) $\cos \frac{\pi}{3}$ $\frac{1}{2}$

10) $\cos \pi$
 -1

11) $\tan \frac{4\pi}{3}$
 $\sqrt{3}$

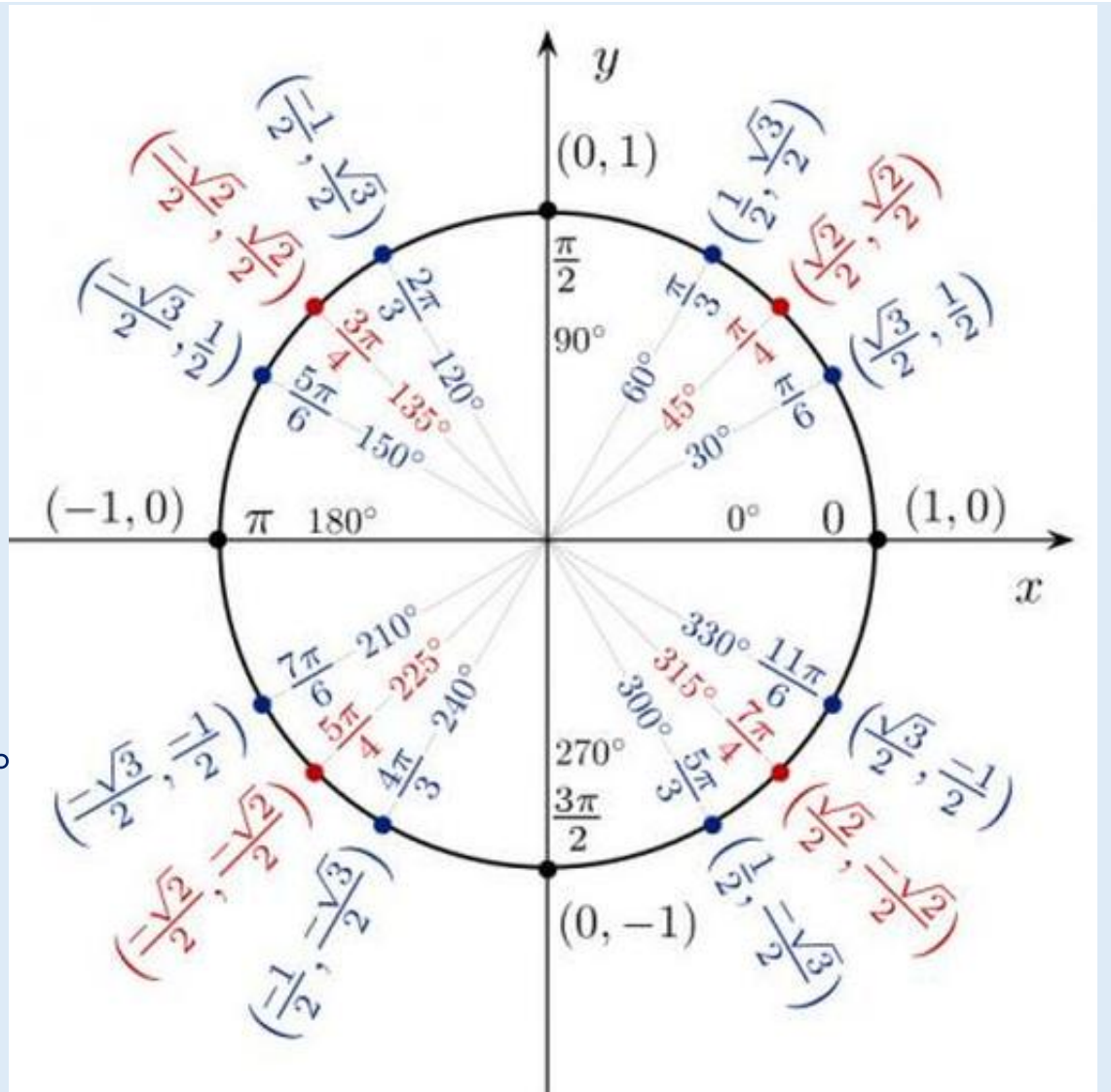
12) $\tan \frac{5\pi}{6}$ $-\frac{\sqrt{3}}{3}$

When you have to find the value of a degree beyond the 0° - 360° values, add (or subtract) 360° until you are back within the original unit circle range.

Examples:

1) $\cos 405^\circ$ $405^\circ - 360^\circ = 45^\circ$
 $\cos 45^\circ = \frac{\sqrt{2}}{2}$

2) $\sin 1200^\circ$ $1200^\circ - 360^\circ = 840^\circ$
 $840^\circ - 360^\circ = 480^\circ$
 $480^\circ - 360^\circ = 120^\circ$
 $\sin 120^\circ = \frac{\sqrt{3}}{2}$



When you have to find the value of a degree beyond the 0° - 360° values, add (or subtract) 360° until you are back within the original unit circle range.

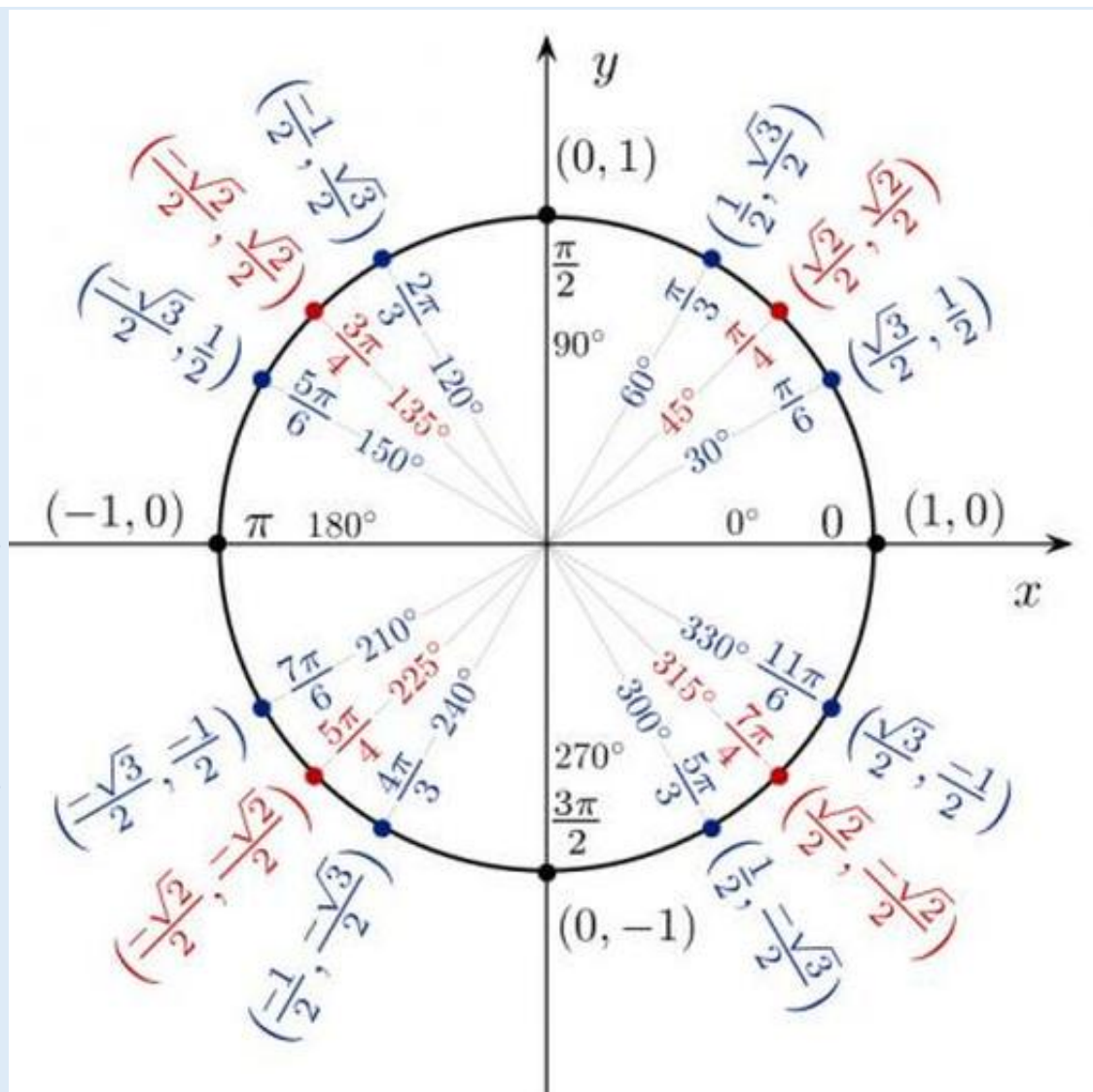
Examples:

$$3) \cos -300^\circ \quad -300^\circ + 360^\circ = 60^\circ$$

$$\cos 60^\circ = \frac{1}{2}$$

$$4) \sin -90^\circ \quad -90^\circ + 360^\circ = 270^\circ$$

$$\sin 270^\circ = -1$$

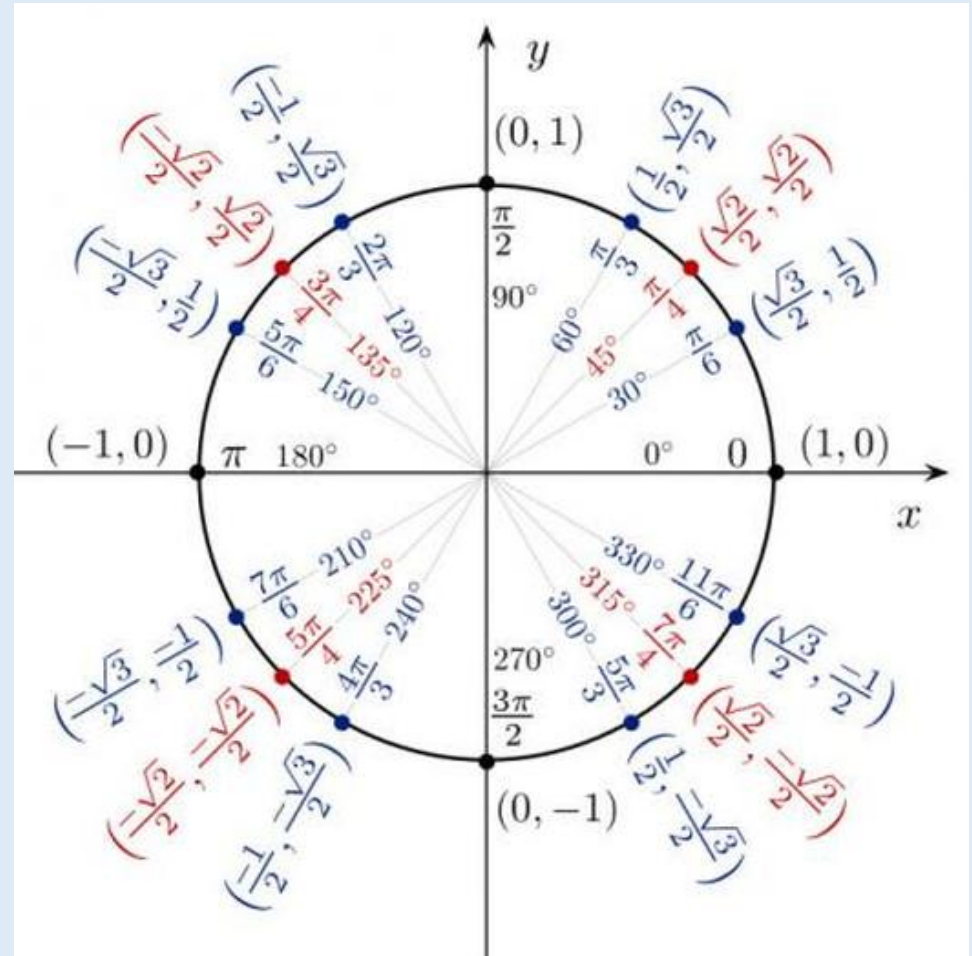


When you have to find the value of a degree beyond the $0\pi - 2\pi$ values, add (or subtract) 2 until you are back within the original unit circle range.

Examples:

$$1) \cos \frac{7\pi}{3} \quad \frac{7}{3} - 2 = \frac{7}{3} - \frac{6}{3} = \frac{1}{3}$$

$$\cos \frac{\pi}{3} = \frac{1}{2}$$



When you have to find the value of a degree beyond the $0\pi - 2\pi$ values, add (or subtract) 2 until you are back within the original unit circle range.

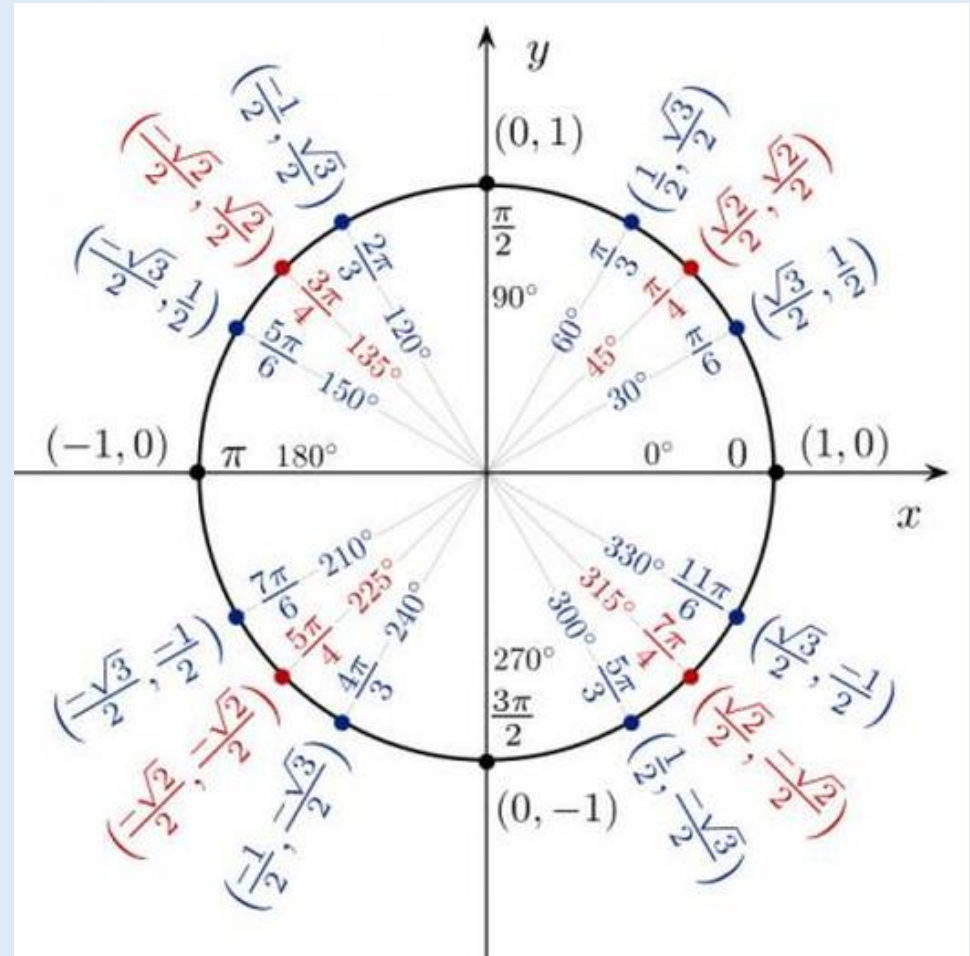
Examples:

$$2) \sin -\frac{31\pi}{6} = -\frac{31}{6} + 2 = -\frac{31}{6} + \frac{12}{6} = -\frac{19}{6}$$

$$-\frac{19}{6} + \frac{12}{6} = -\frac{7}{6}$$

$$-\frac{7}{6} + \frac{12}{6} = \frac{5}{6}$$

$$\sin \frac{5}{6} = \frac{1}{2}$$



Find the exact value of each trigonometric function.

1) $\cos -480^\circ$

2) $\sin 870^\circ$

3) $\cos -225^\circ$

4) $\cos 1035^\circ$

5) $\sin -945^\circ$

6) $\sin 810^\circ$

7) $\cos -5\pi$

8) $\sin 5\pi$

9) $\cos \frac{17\pi}{6}$

10) $\cos -\frac{11\pi}{4}$

11) $\cos -\frac{23\pi}{6}$

12) $\sin \frac{29\pi}{6}$

Find the exact value of each trigonometric function.

1) $\cos -480^\circ = -\frac{1}{2}$

2) $\sin 870^\circ = \frac{1}{2}$

3) $\cos -225^\circ = -\frac{\sqrt{2}}{2}$

4) $\cos 1035^\circ = \frac{\sqrt{2}}{2}$

5) $\sin -945^\circ = \frac{\sqrt{2}}{2}$

6) $\sin 810^\circ = 1$

7) $\cos -5\pi = -1$

8) $\sin 5\pi = 0$

9) $\cos \frac{17\pi}{6} = -\frac{\sqrt{3}}{2}$

10) $\cos -\frac{11\pi}{4} = -\frac{\sqrt{2}}{2}$

11) $\cos -\frac{23\pi}{6} = \frac{\sqrt{3}}{2}$

12) $\sin \frac{29\pi}{6} = \frac{1}{2}$

More trigonometric functions:

$$\sin \theta = y \qquad \text{cosecant} \longrightarrow \csc \theta = \frac{1}{\sin \theta} = \frac{1}{y}$$

$$\cos \theta = x \qquad \text{secant} \longrightarrow \sec \theta = \frac{1}{\cos \theta} = \frac{1}{x}$$

$$\tan \theta = \frac{y}{x} \qquad \text{cotangent} \longrightarrow \cot \theta = \frac{1}{\tan \theta} = \frac{x}{y}$$

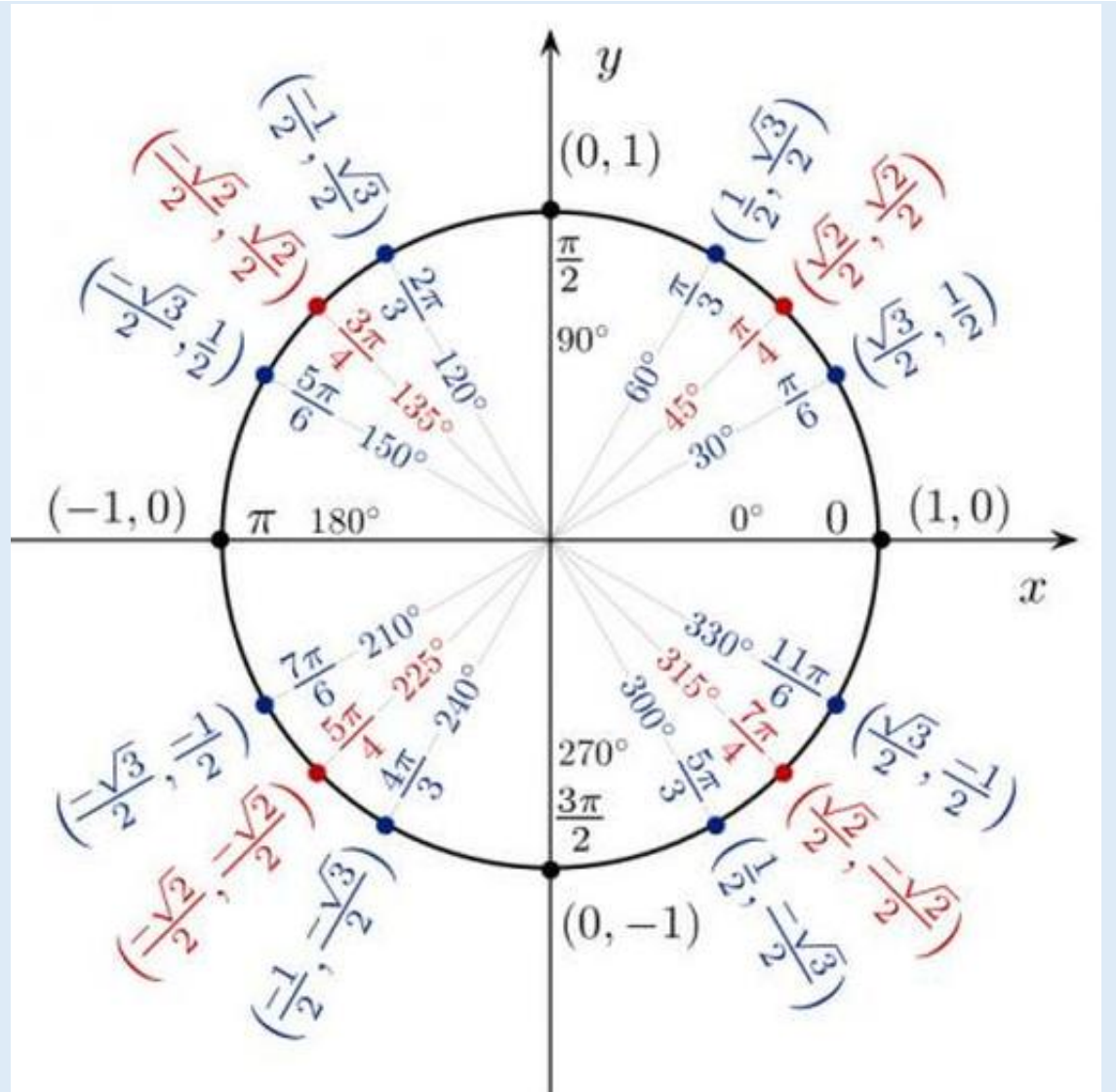
Examples:

1) Find $\csc \frac{\pi}{3}$

$$\sin \frac{\pi}{3} = \frac{\sqrt{3}}{2}$$

so...

$$\csc \frac{\pi}{3} = \frac{1}{\frac{\sqrt{3}}{2}} = \frac{2}{\sqrt{3}} \times \frac{\sqrt{3}}{\sqrt{3}} = \frac{2\sqrt{3}}{3}$$



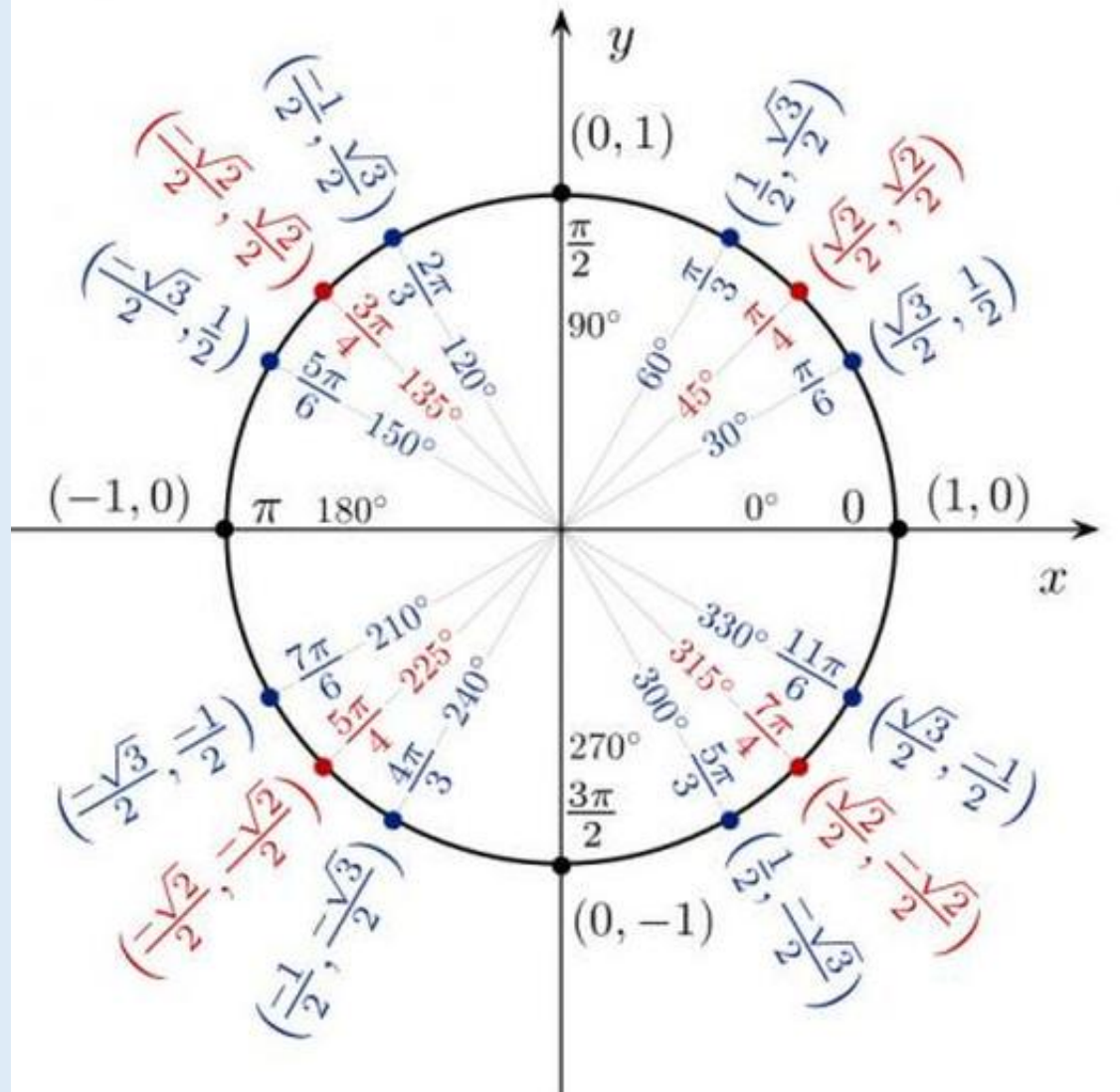
Examples:

2) Find $\sec \frac{\pi}{3}$

$$\cos \frac{\pi}{3} = \frac{1}{2}$$

so...

$$\sec \frac{\pi}{3} = \frac{1}{\frac{1}{2}} = \frac{2}{1} = 2$$



Examples:

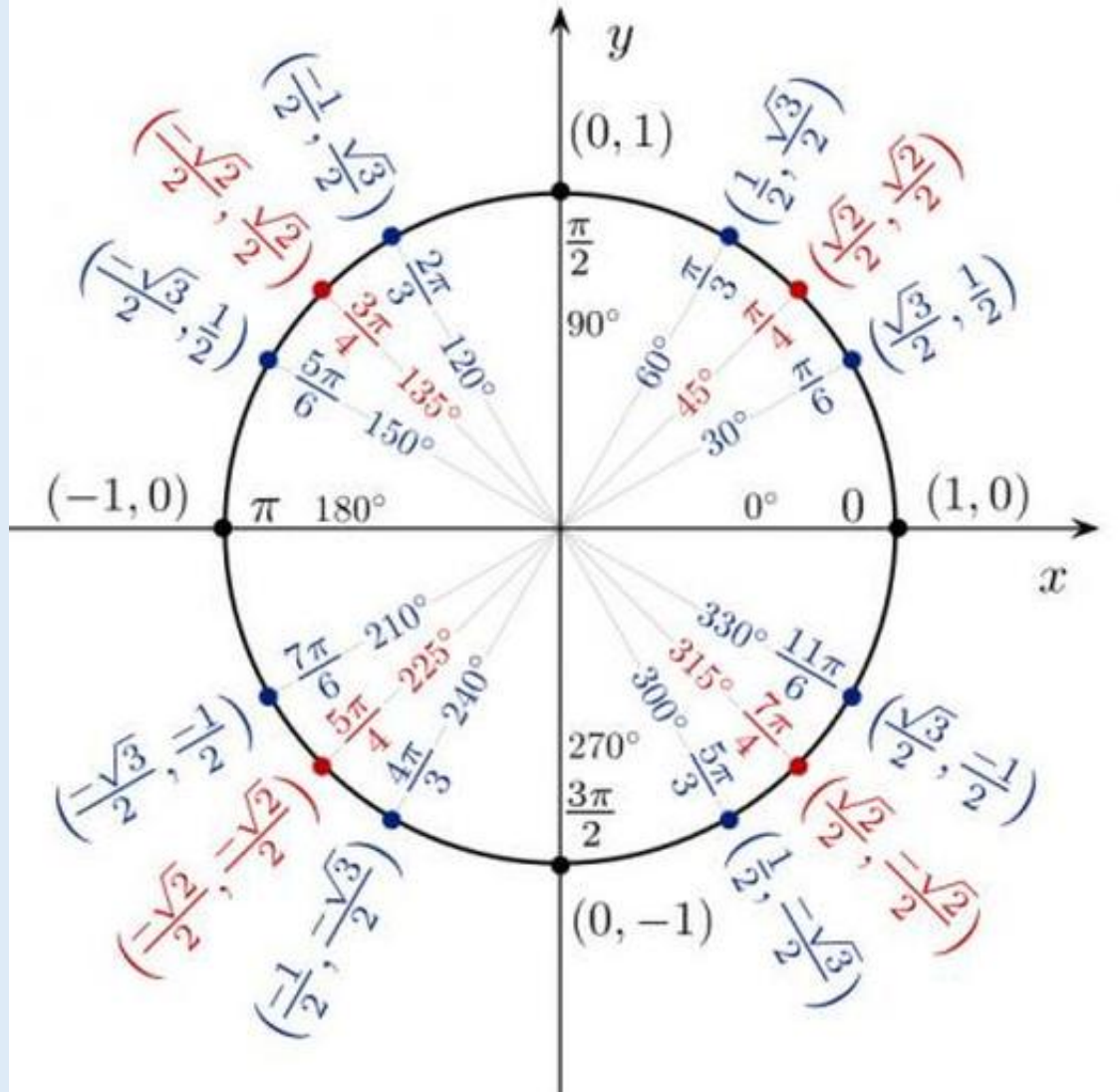
3) Find $\cot \frac{\pi}{3}$

$$\tan \theta = \frac{y}{x} \quad \rightarrow \quad \cot \theta = \frac{x}{y}$$

$$\cot \frac{\pi}{3} = \frac{\frac{1}{2}}{\frac{\sqrt{3}}{2}} = \frac{1}{2} \div \frac{\sqrt{3}}{2} = \frac{1}{2} \times \frac{2}{\sqrt{3}}$$

$$= \frac{1}{1} \times \frac{1}{\sqrt{3}} = \frac{1}{\sqrt{3}} \times \frac{\sqrt{3}}{\sqrt{3}}$$

$$= \frac{\sqrt{3}}{3}$$

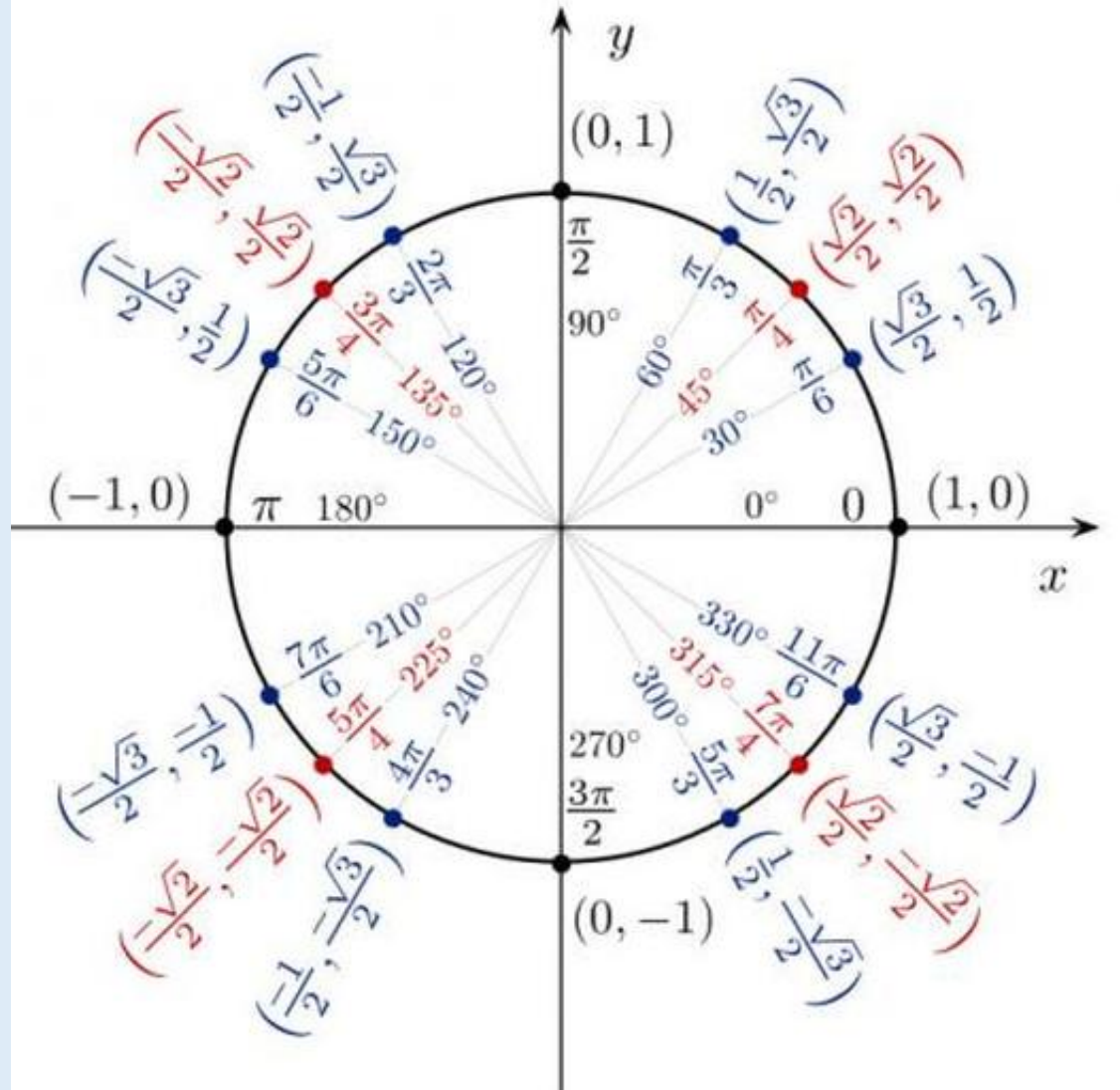


Examples:

4) Find $\cot \frac{\pi}{2}$

$$\tan \theta = \frac{y}{x} \rightarrow \cot \theta = \frac{x}{y}$$

$$\cot \frac{\pi}{2} = \frac{0}{1} = 0$$



Examples:

5) Find $\csc 855^\circ$

$$855^\circ - 360^\circ = 495^\circ - 360^\circ = 135^\circ$$

$$\csc 135^\circ = \frac{2}{\sqrt{2}} \times \frac{\sqrt{2}}{\sqrt{2}} = \frac{2\sqrt{2}}{2} = \frac{1\sqrt{2}}{1}$$

$$= \sqrt{2}$$

