Readiness Review Series

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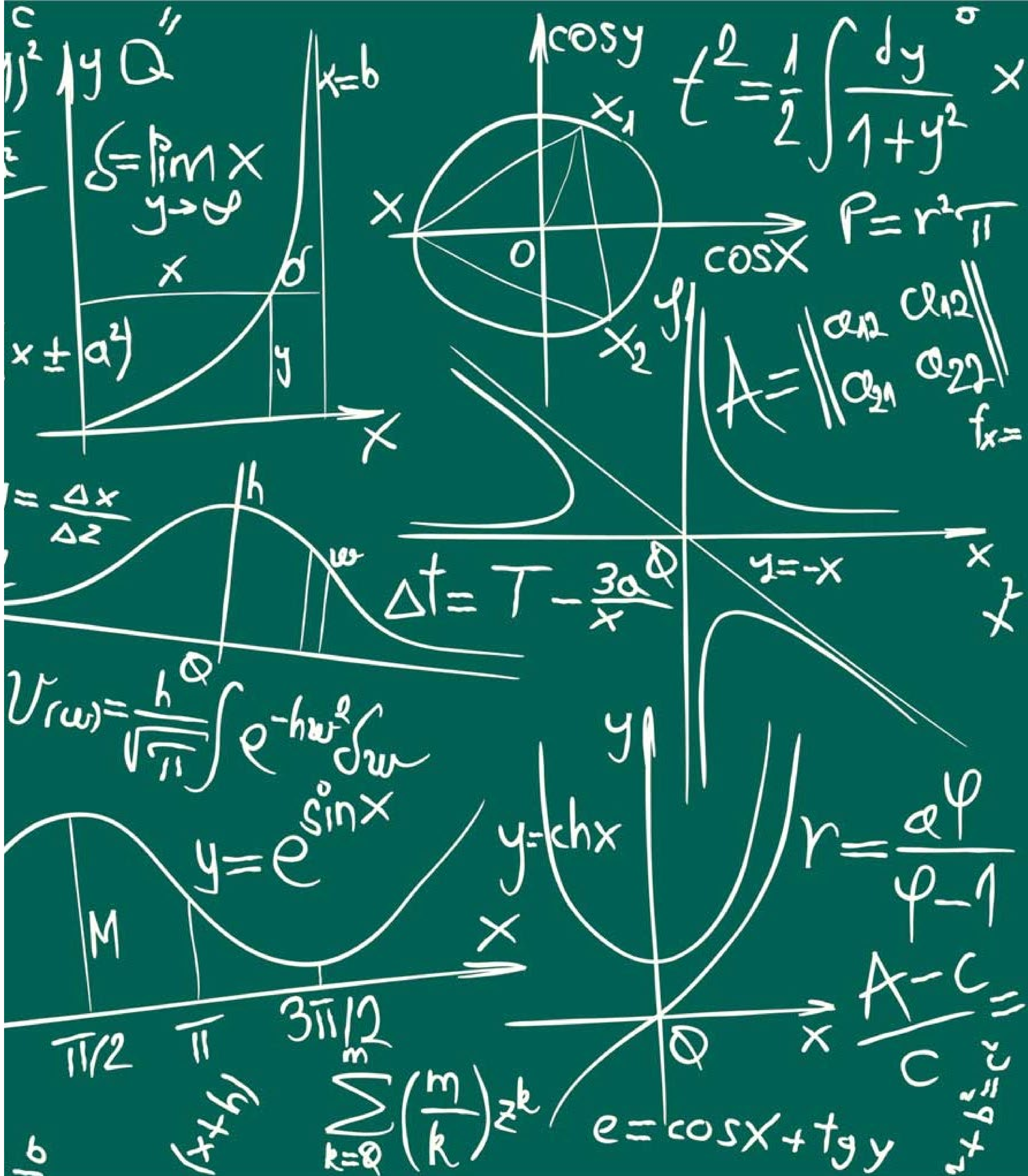


Tips for Math Success

Believe that your intelligence can grow.

The first battle in learning anything is believing you're capable. Cultivating a growth mindset (i.e. believing you're fully capable of mastering new material) will help immeasurably in achieving academic success.

Practice by teaching someone else a difficult concept.

Explaining a concept to someone else will help you work through the material yourself and reinforce the information in your own mind. Once you can successfully teach someone else the concept, you know you've mastered it.

Get tutoring weekly.

ACE, CARE, and Libraries' Learning District all offer free help for math courses. Visit tutoring.fsu.edu for more information on what you can get help with and how to access those programs.

Memorize key formulas/theorums.

Having crucial formulas and concepts on hand will help you navigate the more complex concepts to come.

Tips for Math Success

Always attend class.

This is the best chance to hear extra explanations, ask questions, and gain a stronger understanding of how each concept fits into the overall subject matter.

Start homework the day it is assigned.

The best practice is to complete homework problems without using example problems as a guide or copying answers from another source. Also, even when it is not worth points, you should focus on mastering the content of these assignments.

Make your schedule work for you.

If you are taking 15 credits this semester, create a weekly study schedule with 25 hours of study time during the week. It's also better to create 30 minute time blocks per class throughout the week as opposed to cramming. You'll remember a lot more when exposed to the material multiple times by practicing problems 2 or 3 times outside of class each week.

Be an active reader.

When you read your textbook, paraphrase each paragraph or section to ensure you understand. It can also help to color code your notes to help you identify what you do not understand and give you the chance to ask for clarification later.

Tips for Math Success

Ask for help.

Spend a little bit of time trying to resolve it yourself, but don't spin your wheels.If something doesn't make sense or you feel stuck on a problem or concept, reach out to the instructor or the TAs for guidance. Visiting your instructors regularly in office hours will help you to develop better communication channels and to master the content you do not understand.

If you work with a tutor, make sure you have done some legwork before the tutoring session.

Make sure you know where you could use the additional help so that your tutoring session is effective and efficient.

Work well in advance of deadlines.

Last-minute emergencies and conflicts can never be predicted. You don't want to miss out on earning points because of procrastination.

Be comfortable being uncomfortable.

Learning takes time, and until we have mastered something, we may often lack confidence in our abilities and our knowledge. The more time you spend studying something, the more comfortable you will become with the topic. However, be patient with yourself as you are learning.

MAC1114 – Trigonometry

Table of Contents

Unit Circles

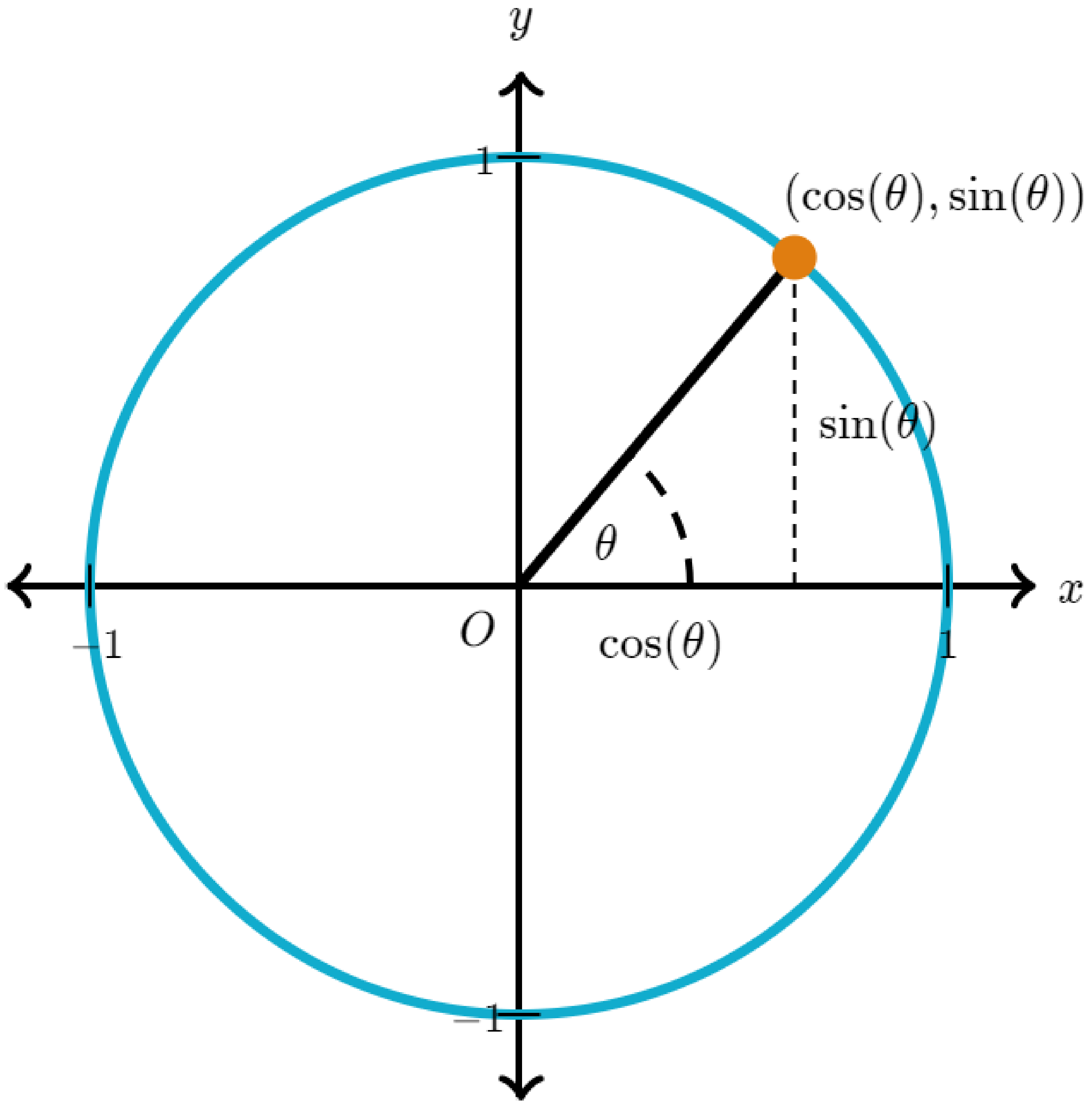
Unit circles allow us to expand the domain of sine and cosine to all real numbers.

The unit circle begins at (1,0) and moves along the circle counterclockwise (right to left) until the angle that is formed between a point on the circle, the x-axis, and the origin, (0,0).

Instead of using rectangular coordinates (x,y), we will use cosθ, sin θ)

X = cos θ

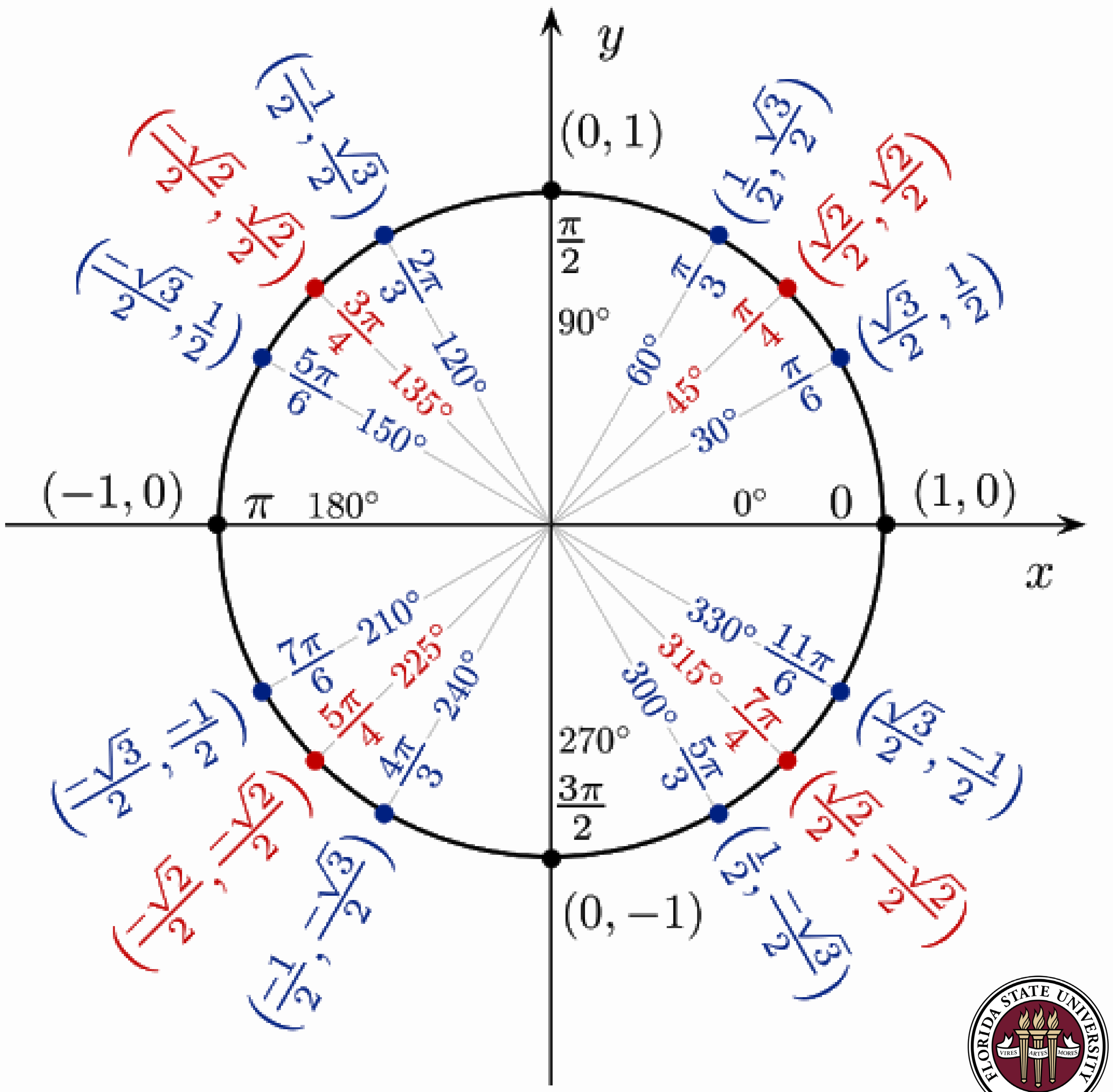
Y = sin θ



Unit Circles

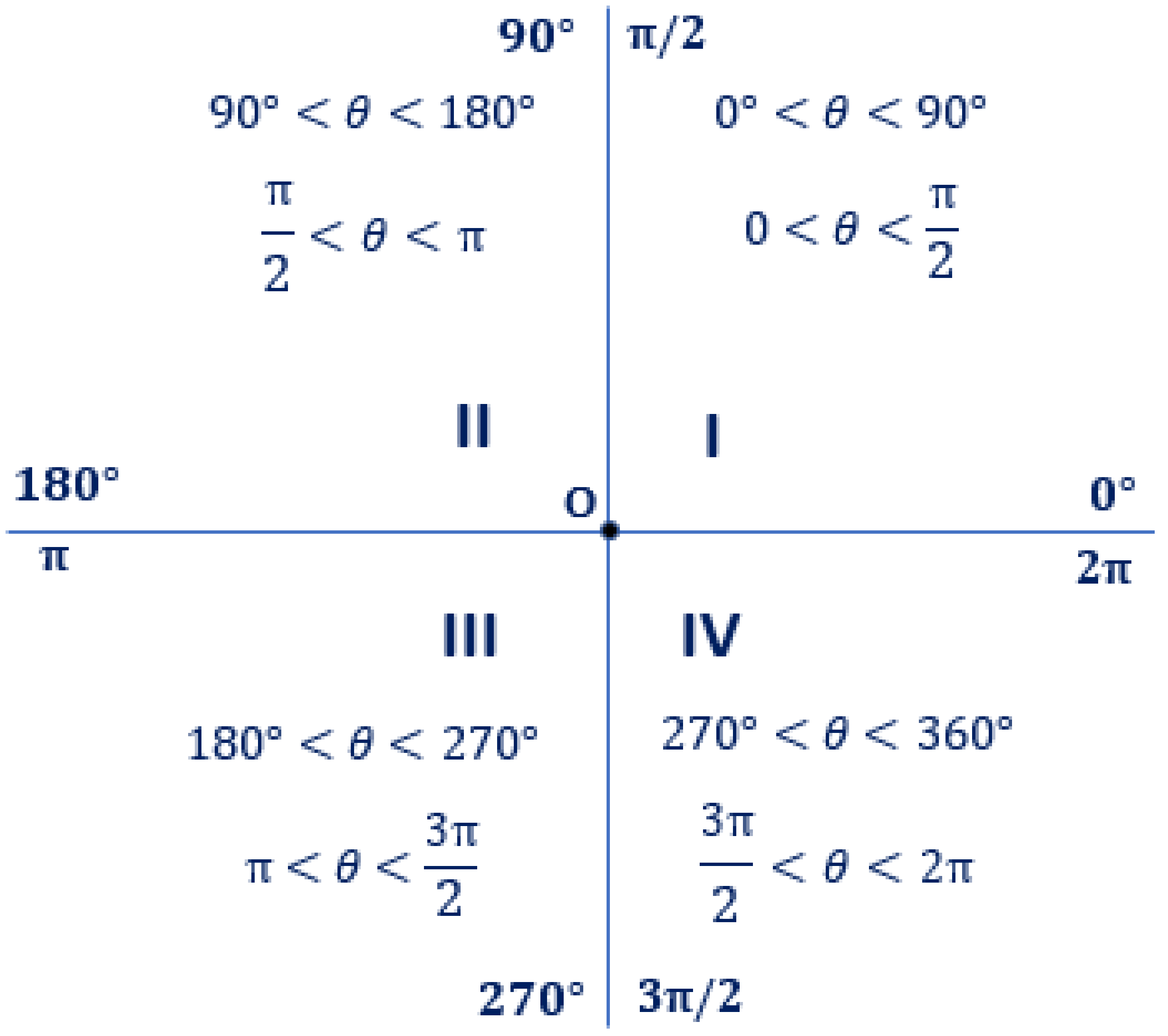
Angles in the unit circle can be represented in three ways:

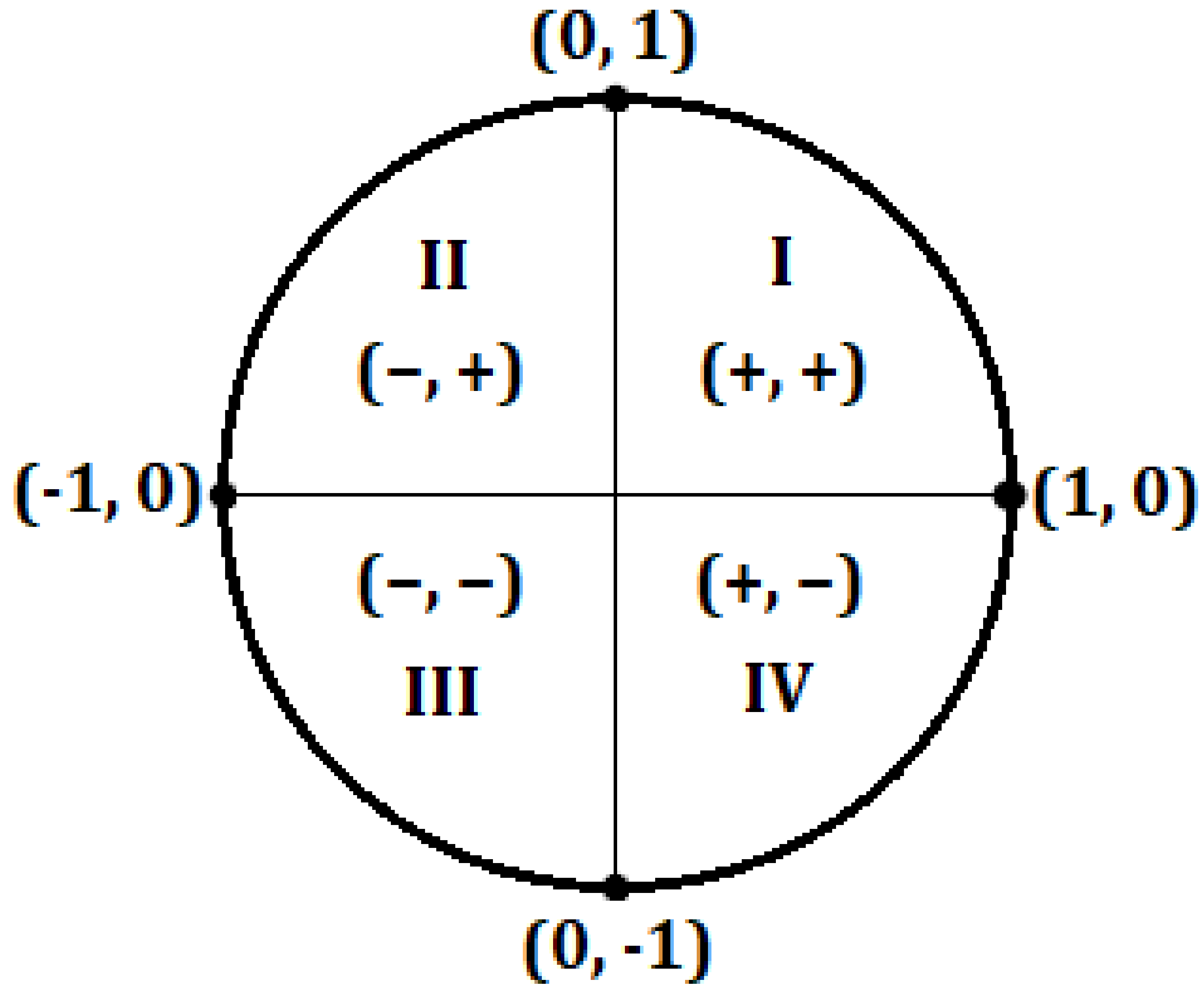
1. A degree
2. A radian
3. An ordered pair



Unit Circles

Quadrants, Bounds, and Signs



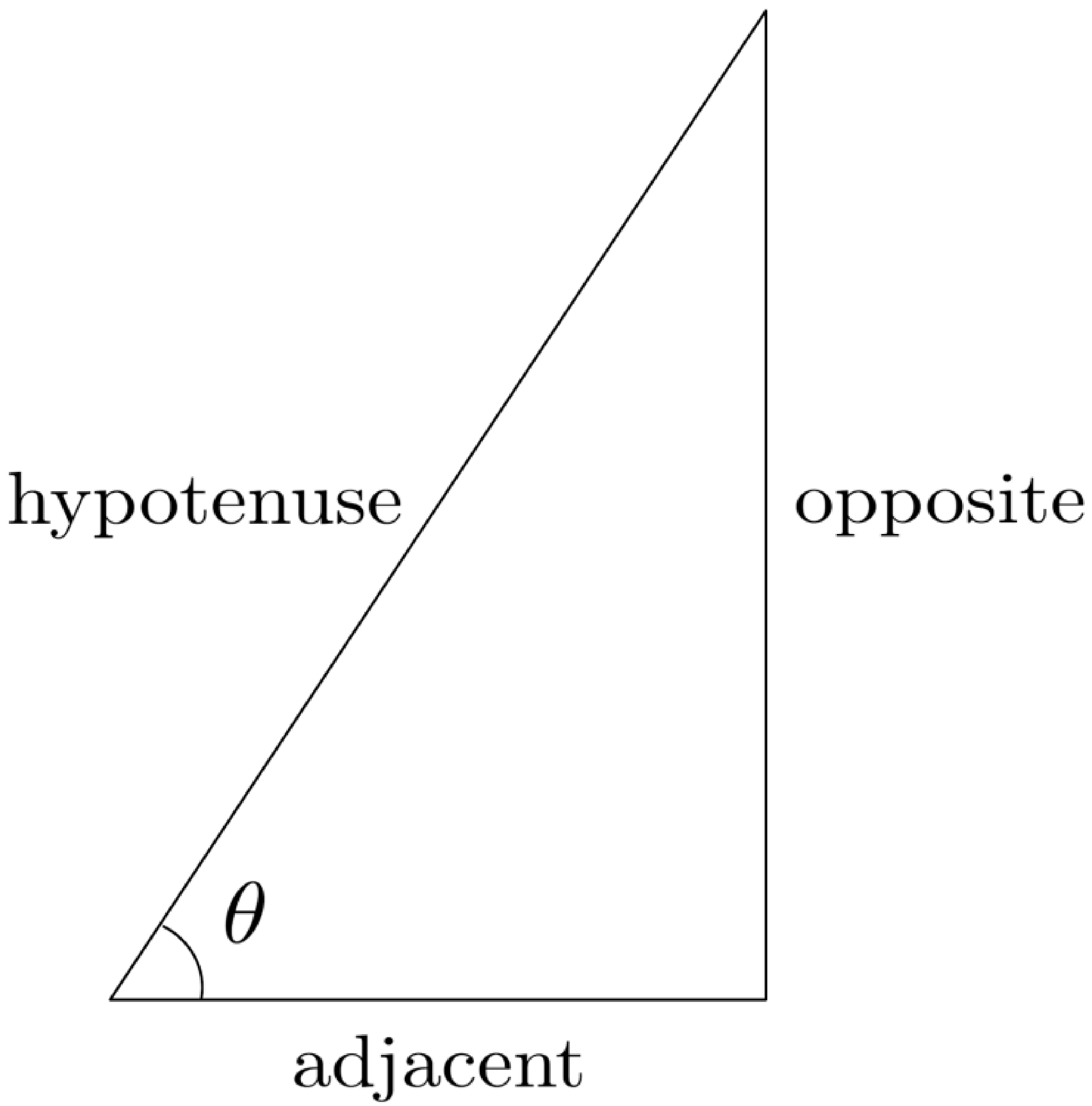


Unit Circles

Triangles

There are three sides to a triangle which we label adjacent, opposite, and hypotenuse. The sides are determined based on their relationship to the location of the angle θ.

- **Adjacent**: the side right next to the angle θ – the angle is made using this side
- **Opposite**: this is the side opposite the location of the angle θ
- **Hypotenuse**: this is the longest side in a triangle or the angle that has the greatest length of all sides



$$\sin\theta = \frac{\text{opposite}}{\text{hypotenuse}}$$

$$\cos\theta = \frac{\text{adjacent}}{\text{hypotenuse}}$$

$$\tan\theta = \frac{\text{opposite}}{\text{adjacent}}$$

Unit Circles

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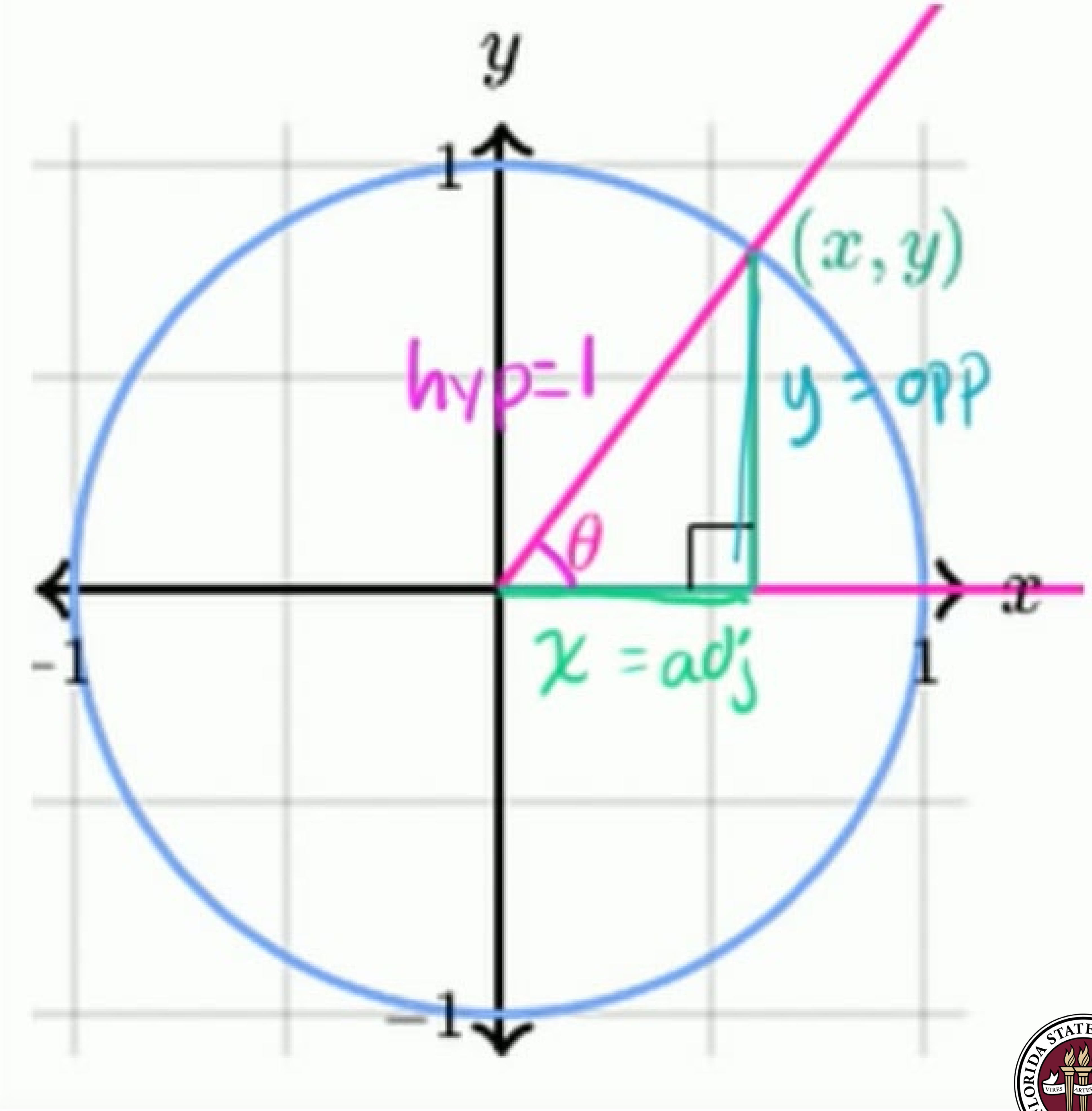


Trigonometric Functions

Triangles

There are 3 basic trig functions used to create trig identities:

- $\cos\theta$, which represents the x-value on an ordered pair in the unit circle
- $\sin\theta$, which represents the y-value on an ordered pair in the unit circle
- $\tan\theta=(\sin(\theta))/(\cos(\theta))$

Types of Trig Function Identities

- Reciprocal
- Quotient
- Pythagorean
- Even/Odd
- Sum/Difference
- Double-Angle
- Half-Angle
- Cofunction
- Sum to Product of 2 angles
- Product to Sum of 2 angles

Trigonometric Identities

Reciprocal

$$\sin(\theta) = \frac{1}{\csc(\theta)} \qquad \csc(\theta) = \frac{1}{\sin(\theta)}$$

$$\cos(\theta) = \frac{1}{\sec(\theta)} \qquad \sec(\theta) = \frac{1}{\cos(\theta)}$$

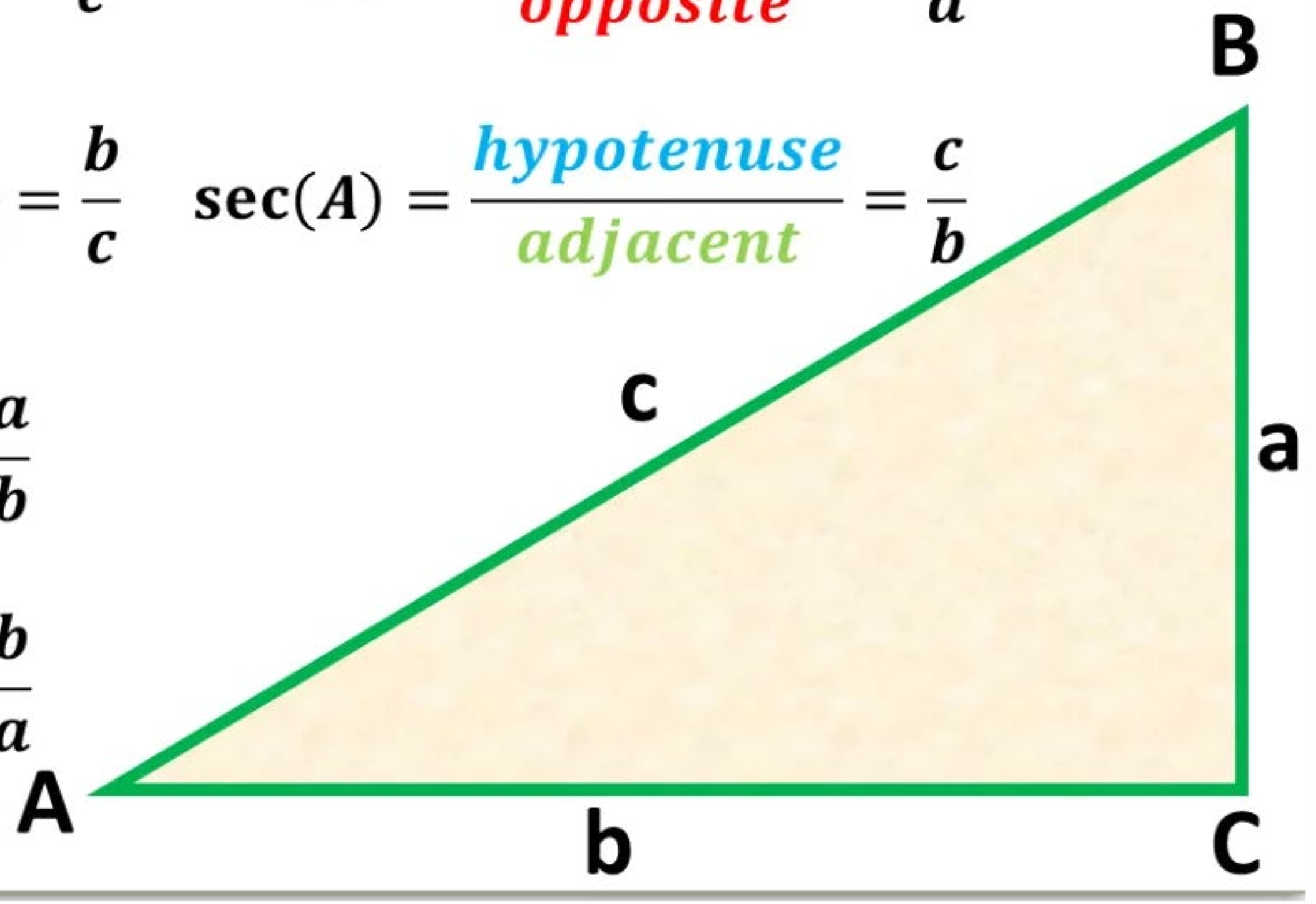
$$\tan(\theta) = \frac{1}{\cot(\theta)} \qquad \cot(\theta) = \frac{1}{\tan(\theta)}$$

$$\sin(A) = \frac{\textit{opposite}}{\textit{hypotenuse}} = \frac{a}{c} \qquad \csc(A) = \frac{\textit{hypotenuse}}{\textit{opposite}} = \frac{c}{a}$$

$$\cos(A) = \frac{\textit{adjacent}}{\textit{hypotenuse}} = \frac{b}{c} \qquad \sec(A) = \frac{\textit{hypotenuse}}{\textit{adjacent}} = \frac{c}{b}$$

$$\tan(A) = \frac{\textit{opposite}}{\textit{adjacent}} = \frac{a}{b}$$

$$\cot(A) = \frac{\textit{adjacent}}{\textit{opposite}} = \frac{b}{a}$$



Trigonometric Identities

Reciprocal Example

Find the reciprocal identity for $\boldsymbol{sin\, x = \frac{3}{7}}$

1. $\sin x = \frac{3}{7}$
   - Recall that $\csc(x) = \frac{1}{\sin(x)}$
2. Substitute the value of $\sin x = \frac{3}{7}$ into the reciprocal formula
   - $\csc(x) = \frac{1}{\frac{3}{7}}$
     - Recall: To simplify a term that has a fraction inside of a fraction you should multiply the numerator value by the reciprocal of the denominator
   - $\csc(x) = 1 \cdot \frac{7}{3}$
3. Simplify.
   - $\csc(x) = \frac{7}{3}$

Trigonometric Identities

Quotient

Example 1: Find $\boldsymbol{tan\frac{\pi}{6}}$

1. Where is this trig function located on the unit circle?

$$\tan\theta = \frac{\sin\theta}{\cos\theta}$$

$$\cot\theta = \frac{\cos\theta}{\sin\theta}$$

Trigonometric Identities

Pythagorean

Example:

1. Prove $\tan(\theta)+\cot(\theta)=\sec(\theta)\csc(\theta)$

2. $\sec(\theta)-\sin(\theta)\tan(\theta)$

3. Prove $\cos(\theta)\cot(\theta)=(1+\csc(\theta))(1-\sin(\theta))$

$$\sin^2\theta + \cos^2\theta = 1$$

$$\sec^2\theta - \tan^2\theta = 1$$

$$\csc^2\theta - \cot^2\theta = 1$$

Inverse Trig

Inverse Trig functions are used to solve problems in which you want to solve for the angle of a triangle.

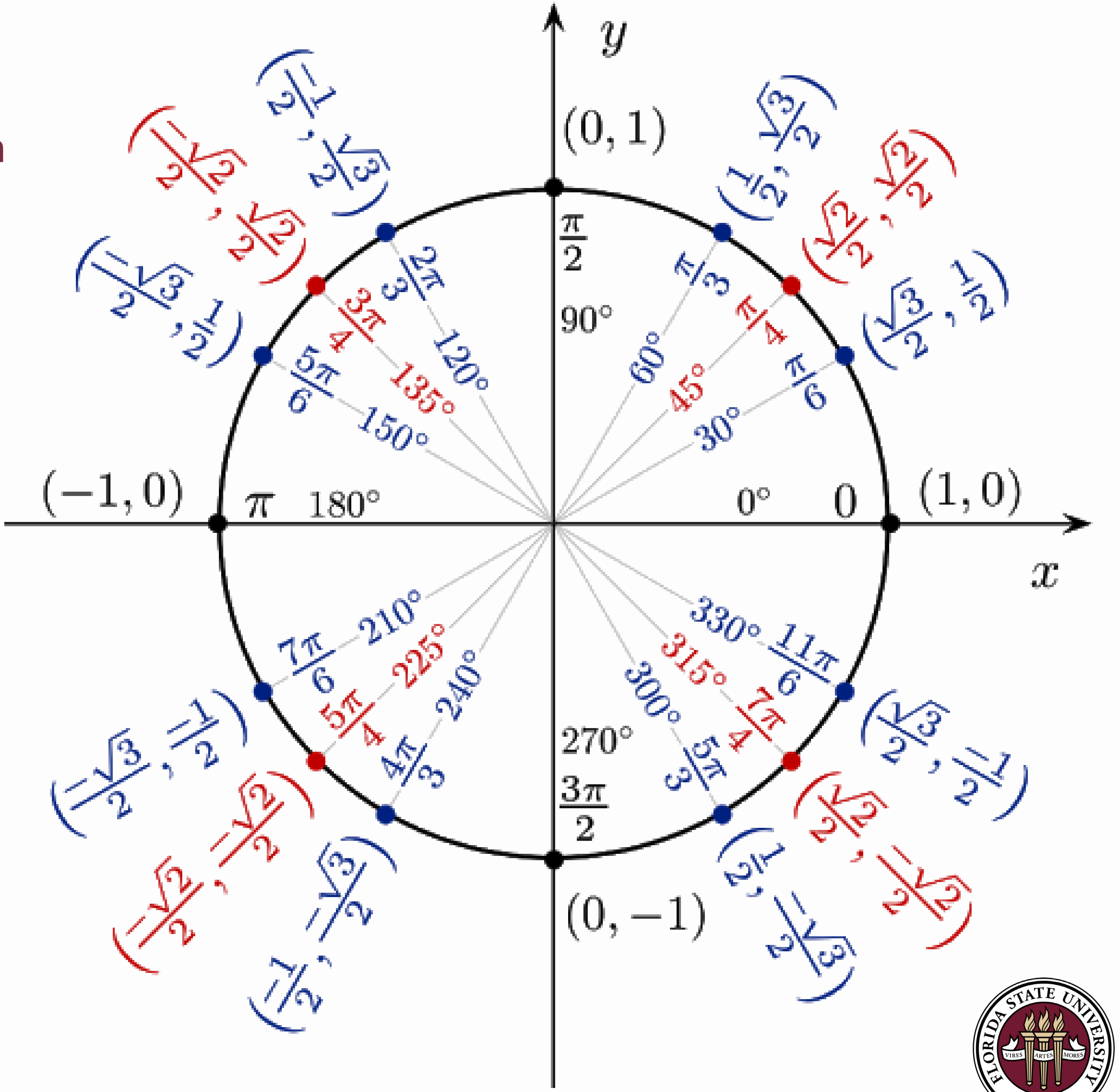
NOTE: Unless given a specific domain (e.g. $0<\theta<\pi/2$), there is usually more than one solution.

NOTE: $\sin^{-1}(\theta)\neq 1/\sin(\theta)$

To find the value of an inverse trig function, reference the coordinates on the unit circle. The answer or answers are the angles which give you the value of the trig function at those angles.

Examples:

1. $\cos^{-1}(1)=0$
2. $\sin^{-1}(1)=\pi/2$
3. $\sin^{-1}(-½)=7\pi/6,\ 11\pi/6$
4. $0<\theta<\pi/2$, $\cos^{-1}(½)=\pi/3$



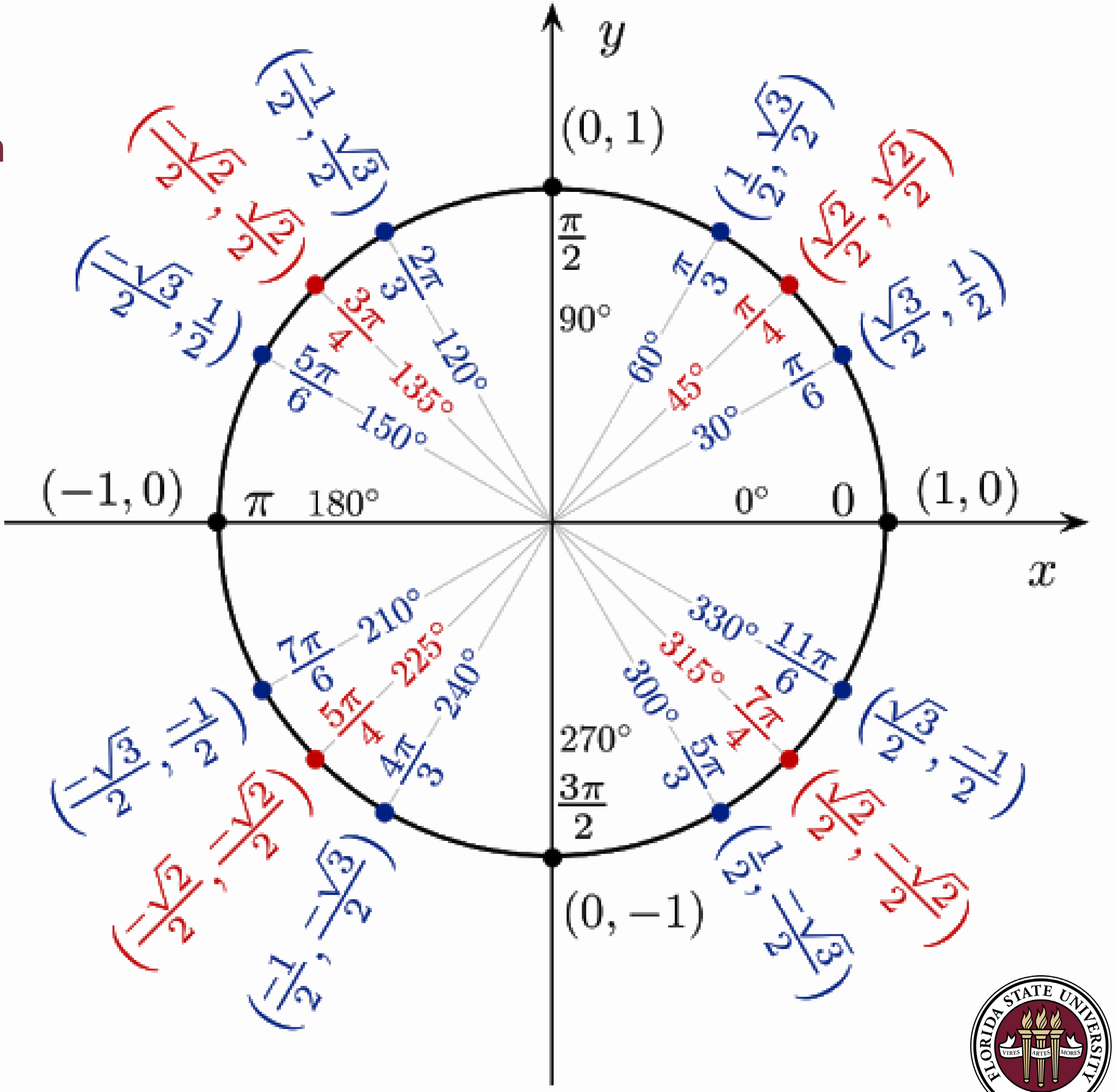
Inverse Trig

Inverse Trig functions are used to solve problems in which you want to solve for the angle of a triangle.

Example:

Solve for θ: $\sin(\theta)=½$

Applying the inverse sin on both sides gives us
$\sin^{-1}(\sin(\theta))=\sin^{-1}(½)$
The sin and inverse sin cancel out, giving us
$\theta=\sin^{-1}(½)$
$\theta=\pi/6, 5\pi/6$



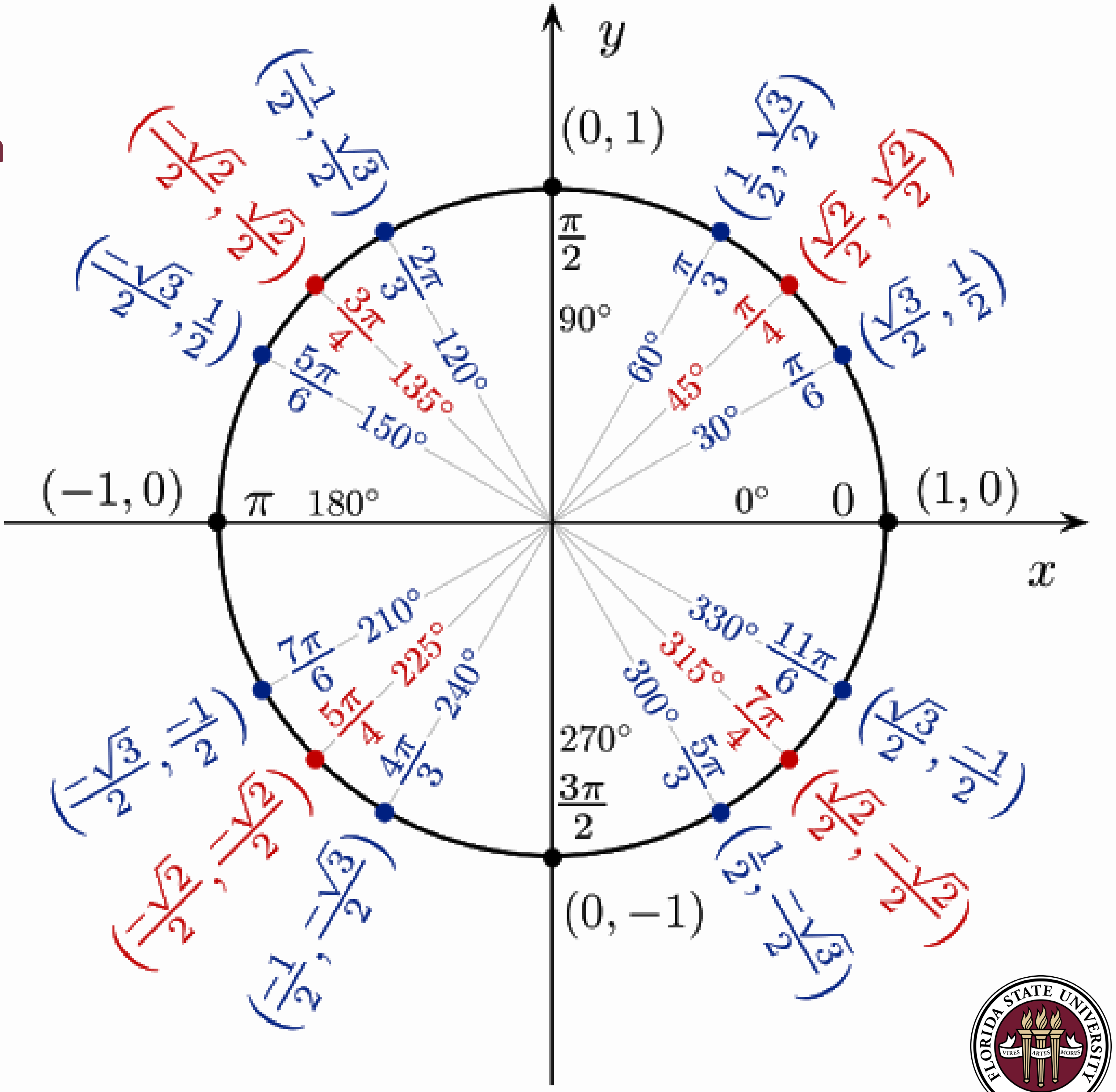
Inverse Trig

Inverse Trig functions are used to solve problems in which you want to solve for the angle of a triangle.

Example:

Solve for θ: $2\cos^{-1}(x)=2\pi/3$

Dividing both sides by 2 gives us
$\cos^{-1}(x)=\pi/3$
Applying the inverse cosine gives us
$\cos(\cos^{-1}(x))=\cos(\pi/3)$
The cosines cancel, giving us
$X=\cos(\pi/3)=½$



References & Resources

Use these links for more information or come visit one of the FSU tutoring programs for one-on-one help!

- **Paul's Online Math Notes** (tutorial.math.lamar.edu/): The intent of this site is to provide a complete set of free online (and downloadable) notes and/or tutorials for math classes. They're written the notes/tutorials to be accessible to anyone wanting to learn the subject.

- **Desmos** (desmos.com/calculator): To create a new graph, just type your expression in the expression list bar. As you are typing your expression, the calculator will immediately draw your graph on the graph paper.

- **CalcPlot3D** (c3d.libretexts.org/CalcPlot3D/index.html): This dynamic Java applet allows the user to simultaneously plot multiple 3D surfaces, space curves, parametric surfaces, vector fields, contour plots, and more in a freely rotatable graph.

References & Resources

Use these links for more information or come visit one of the FSU tutoring programs for one-on-one help!

Other Useful Websites, Reviews, and Sources:

- https://www.khanacademy.org/math/trigonometry
- https://owlcation.com/stem/Reciprocal-Identities-in-Trigonometry-With-Examples

Tell us how we're doing!

The QR code below will take you to a survey about the Readiness Review Series.

We're always interested in improving, so we're asking for your feedback.

What was your experience like? Is there anything we should add, change, or remove?

Do you have ideas for how this program should be expanded in the future?

Scan the code and fill out the short survey to let us know!