Section 1.3 : Trigonometric Functions

Chapter 1 : Functions
Math 1551, Differential Calculus

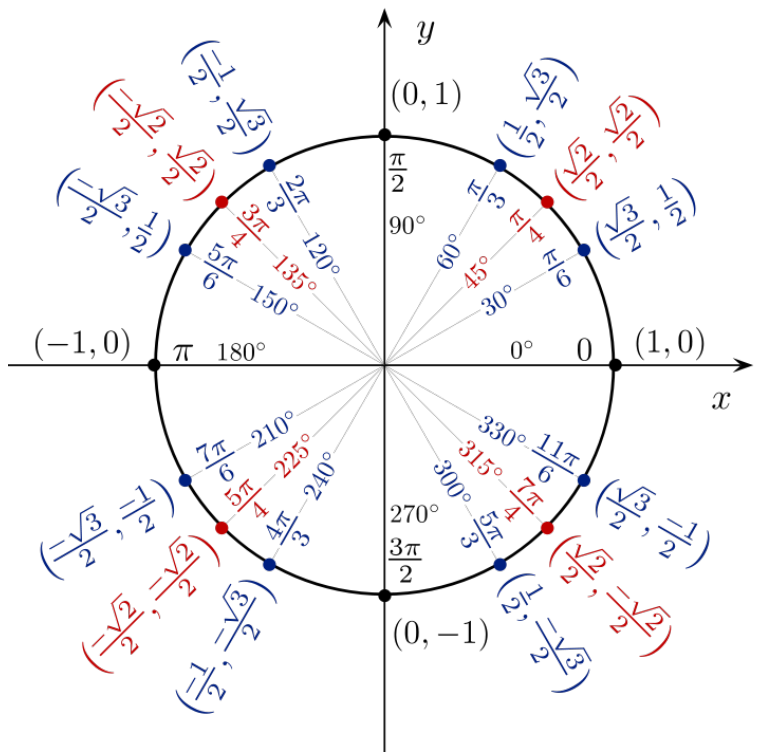

image by wikipedia user Gustab

1.3 Trigonometric Functions

Topics

This section reviews material covered in a pre-requisite course. We will review these topics in this section.

1. Arc length, degrees and radians
2. Trigonometric functions and identities

Learning Objectives

For the topics in this section, students are expected to be able to:

1. Apply arc length formulas.
2. Sketch trigonometric functions.
3. Apply identities to simplify and evaluate expressions involving trigonometric functions.

Sketch Functions

You need to be able to sketch the standard trigonometric functions.

$$\begin{array}{lll} \cos x & \sin x & \tan x \\ \sec x & \csc x & \cot x \end{array}$$

Example 1: Sketch $y(x) = 1 + \csc(\pi x)$.

Addition and Pythagorean Identities

Addition Formulas

$$\cos(A \pm B) = \cos A \cos B \mp \sin A \sin B$$
$$\sin(A \pm B) = \sin A \cos B \pm \cos A \sin B$$

The **Pythagorean identity**

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

can be used derive

$$1 + \tan^2 x = \_\_\_\_\_ , \qquad \cot^2 x + 1 = \_\_\_\_\_$$

Double and Half Angle Identities

Double Angle Formulas

$$\cos(2u) = \cos^2 u - \sin^2 u$$
$$\sin(2u) = 2 \sin u \cos u$$

Half Angle Formulas

$$\cos^2 \theta = \frac{1 + \cos 2\theta}{2}$$
$$\sin^2 \theta = \frac{1 - \cos 2\theta}{2}$$

Additional Examples (if time permits)

Students should be able to solve the following.

a) solve $\sin^2 t = \cos^2 t$ for t.

b) express $y(t)$ as a single sine function $y(t) = \frac{1}{\sqrt{2}}(\cos(t) - \sin(t))$

c) use a trigonmetric identity to evaluate $\cos^2\left(\frac{\pi}{12}\right)$

Students are encouraged to review these problems and discuss their solutions on Piazza or during office hours.