Trigonometry

Topics

In this document we will review

- Evaluating trigonometric functions

- Some trigonometric function properties

Why do we need this?

Examples are listed below from several different sections and chapters.

Example 1 (From Section 1.4). Determine the average rate of change of the function $f(t) = 2 - \cos t$ over the interval $[0, \frac{2\pi}{3}]$.
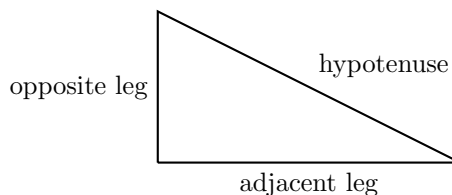
Example 2 (From Section 1.5). Evaluate the following limit: $\lim\limits_{x \to \pi/3} x^2 \sec 4x$

Example 3 (From Section 4.4). Find the average value of $f(x) = 5\cos x$ on the interval $\left[0, \frac{\pi}{4}\right]$.

Important Definitions and Theorems

Definition 4. Right triangle definitions of the six trigonometric functions where $0 \le \theta \le \pi/2$:

$$\sin\theta = \frac{opp}{hyp} \qquad \csc\theta = \frac{hyp}{opp}$$

$$\cos\theta = \frac{adj}{hyp} \qquad \sec\theta = \frac{hyp}{adj}$$

$$\tan\theta = \frac{opp}{adj} \qquad \cot\theta = \frac{adj}{opp}$$

Identity 5. Reciprocal Identities

$$\sin u = \frac{1}{\csc u} \qquad \cos u = \frac{1}{\sec u} \qquad \tan u = \frac{1}{\cot u}$$

$$\csc u = \frac{1}{\sin u} \qquad \sec u = \frac{1}{\cos u} \qquad \cot u = \frac{1}{\tan u}$$

Identity 6. Quotient Identities

$$\tan u = \frac{\sin u}{\cos u} \qquad \cot u = \frac{\cos u}{\sin u}$$

Identity 7. Pythagorean Identities

$$\sin^2 u + \cos^2 u = 1 \qquad 1 + \tan^2 u = \sec^2 u$$

Identity 8. Power Reducing Identities

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

Definition 9. Unit Circle definitions of the six trigonometric functions where θ is any angle:
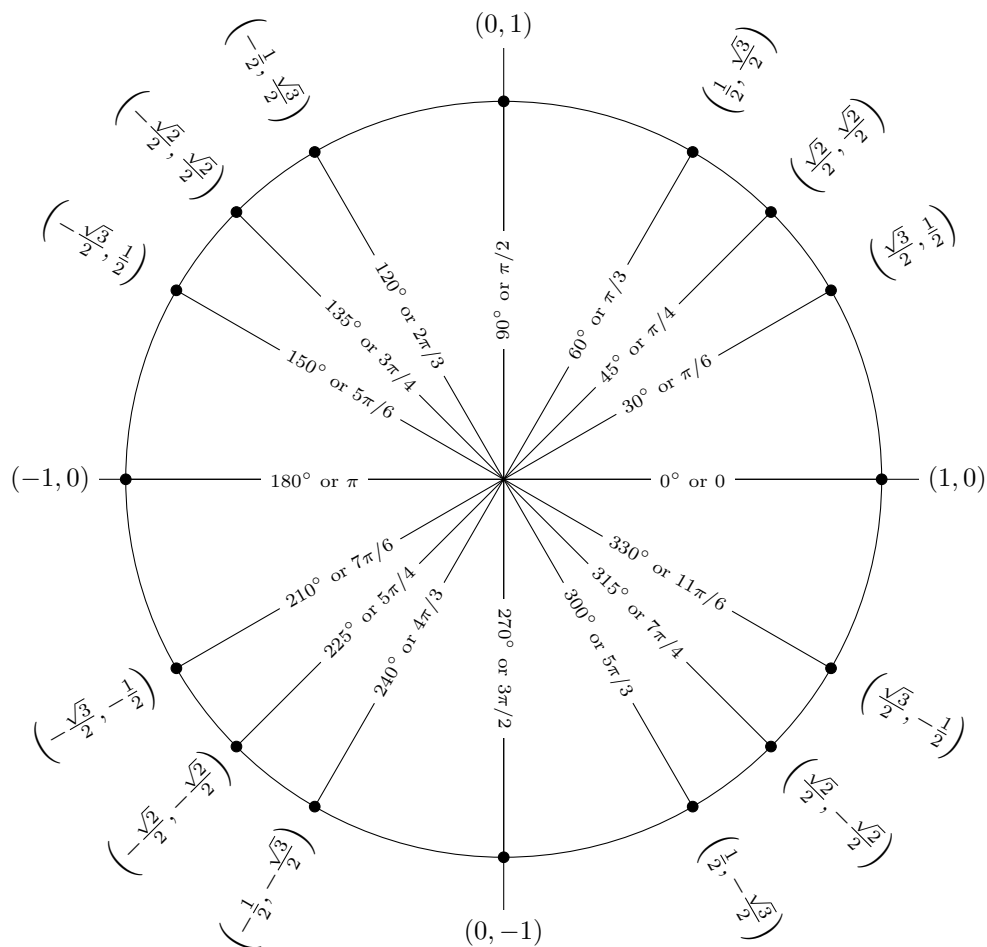
$$\sin\theta = y$$

$$\csc\theta = \frac{1}{y}$$

$$\cos\theta = x$$

$$\sec\theta = \frac{1}{x}$$

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

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

Instructional Videos

Click on the following links to access helpful instructional videos:

- Right Triangle Definitions of Trig Functions
  www.math.msu.edu/classes/mth_132/review_video/trig1.aspx

- Unit Circle Definitions of Trig Functions
  www.math.msu.edu/classes/mth_132/review_video/trig2.aspx

- More Unit Circle Definitions of Trig Functions
  www.math.msu.edu/classes/mth_132/review_video/trig3.aspx

- Trig Identities
  www.math.msu.edu/classes/mth_132/review_video/trig4.aspx

Now that you have been exposed to all the ideas and seen a couple solutions worked out you should try a few problems. Please see the quiz which has some questions for you to try and the answers posted at the end. The important thing is the work that leads to the answers. That's where you come in!