PreCalculus Name: Period: Date:

12/17

Lesson 5-2b: Trigonometric Functions of Real Numbers II

Objectives

Students will…
- Be able to use a calculator to evaluate trigonometric functions (both radians and degree)
- Be able to know and apply the even-odd properties of trigonometric functions.

Trigonometric Functions

The concept of trigonometric functions can be defined in terms of the unit circle. The **definition of trigonometric functions** is as follows:

$\cos t = x$ $\quad \sin t = y$ $\quad \tan t = \frac{y}{x}\ (x \neq 0)$

$\sec t = \frac{1}{\cos t} = \frac{1}{x}\ (x \neq 0)$ $\quad \csc t = \frac{1}{\sin t} = \frac{1}{y}\ (y \neq 0)$ $\quad \cot t = \frac{1}{\tan t} = \frac{x}{y}\ (y \neq 0)$

Evaluating Trigonometric Functions

The previous definitions of trigonometric functions are only helpful to us if t happens to be one of the values on the unit circle. Consider for example, $\cos\frac{\pi}{7}$

Since $\frac{\pi}{7}$ is not on the unit circle, we would have to use a calculator to evaluate this function.

One thing to keep in mind is that trigonometric functions can be evaluated using both degrees and radians. It is **CRUCIAL** that the calculator is in the right mode. For most calculators, DEG=Degrees, and RAD=Radians.

So, going back to our problem, since $\frac{\pi}{7}$ is a radian value (no deg sign), we need to put our calculator in radian mode.

$$\cos\frac{\pi}{7} \approx 0.9$$

Try doing these problems. Note that they are all in radians.

$\sin\frac{\pi}{5} \approx$ $\quad \tan\frac{7\pi}{9} \approx$ $\quad \cos\frac{6\pi}{31} \approx$ $\quad \tan\frac{11\pi}{8} \approx$ $\quad \sin\frac{7\pi}{5} \approx$

Now, let's try a couple problems in degree mode.

$\sin 33° \approx$ $\quad \cos 67° \approx$ $\quad \tan 0.889° \approx$

Also, remember that $\sec t = \frac{1}{\cos t}$, $\csc t = \frac{1}{\sin t}$, and $\cot t = \frac{1}{\tan t}$

Thus, $\csc 67° = \frac{1}{\sin 67} \approx$ and $\sec\frac{\pi}{8} = \frac{1}{\cos \pi/8} \approx$

Try these. Make sure you're in the right mode.

$\cot\frac{\pi}{19} \approx$ $\quad \csc 65.98° \approx$ $\quad \sec\frac{27\pi}{16} \approx$

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Even-Odd Properties

Consider the following.

$\sin\frac{\pi}{3} =$ $\sin\left(-\frac{\pi}{3}\right) = \sin(\quad) =$

Now, what about…

$\cos\frac{\pi}{3} =$ $cos\left(-\frac{\pi}{3}\right) = \cos(\quad) =$

Turns out, these results can be generalized.

<u>Even-Odd Properties</u>:

$\cos(-t) =$ $\sin(-t) =$ $\tan(-t) =$

$\csc(-t) =$ $\sec(-t) =$ $\cot(-t) =$

Examples

Use the Even-Odd Properties to evaluate the following.

$\sin\left(-\frac{\pi}{6}\right) =$ $cos\left(-\frac{\pi}{4}\right) =$

$\cot\left(-\frac{5\pi}{6}\right) =$ $csc\left(-\frac{2\pi}{3}\right) =$

$\tan\left(-\frac{11\pi}{6}\right) =$ $\sec\left(-\frac{\pi}{2}\right) =$

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Worksheet.