Off-Site Instruction Packet Day 8

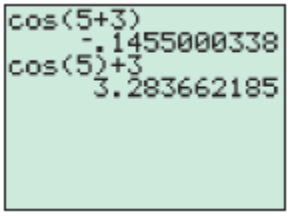
6-5 Day 1 Basic Trigonometric Identities

The algebra of trigonometric functions is just like that of other functions. They may be added, subtracted, composed, etc. However, two notational conventions are normally used with trigonometric functions.

Parenthesis can be omitted whenever no confusion can result.

Below shows, however, that parenthesis *are* needed to distinguish.

$\cos(t+3)$ and $\cos t + 3$



When dealing with powers of trigonometric functions,

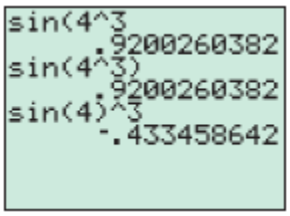
Exponents (other than -1) are written between the function symbol and the variable.

For example,

$(\cos t)^3$ is written $\cos^3 t$

Furthermore,

$\sin t^3$ means $\sin(t^3)$ *not* $(\sin t)^3$ *or* $\sin^3 t$



Identities – *an equation that is true for all values of the variables for which every term of the equation is defined.*

Quotient Identities

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

Example 1: **Quotient Identities**

Simplify the expression. $\tan t \cos t$

$$\frac{\sin t}{\cos t} \cdot \cos t = \sin t$$

Reciprocal Identities

$$\sin t = \frac{\mathbf{1}}{\boldsymbol{csc\ t}} \qquad \cos t = \frac{\mathbf{1}}{\boldsymbol{sec\ t}} \qquad \tan t = \frac{\mathbf{1}}{\boldsymbol{cot\ t}}$$

$$\csc t = \frac{\mathbf{1}}{\boldsymbol{sin\ t}} \qquad \sec t = \frac{\mathbf{1}}{\boldsymbol{cos\ t}} \qquad \cot t = \frac{\mathbf{1}}{\boldsymbol{tan\ t}}$$

Example 2: **Reciprocal Identities**

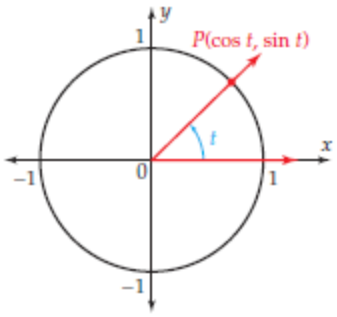
Given that $\sin t = 0.28$ and $\cos t = 0.96$, find $\csc t$ and $\sec t$

$$\csc t = \frac{1}{\sin t} = \frac{1}{0.28} = 3.57$$

$$\sec t = \frac{1}{\cos t} = \frac{1}{0.96} = 1.04$$

Pythagorean Identities

For any real number t, the coordinates of the point P where the terminal side of an angle of t radians meets the unit circle are $(\cos t\,, \sin t)$, as shown.



Since P is on the unit circle, its coordinates must satisfy ___$x^2 + y^2 = 1$_____, which is the equation of the unit circle. That is,

$$\sin^2 t + \cos^2 t = 1$$
$$\frac{\sin^2 t}{\cos^2 t} + \frac{\cos^2 t}{\cos^2 t} = \frac{1}{\cos^2 t}$$
$$\tan^2 t + 1 = \sec^2 t$$

$\sin^2 t + \cos^2 t = 1$
$\tan^2 t + 1 = \sec^2 t$
$1 + \cot^2 t = \csc^2 t$

Example 3: **Pythagorean Identities**

Simplify the expression below.

$$\tan^2 t \cos^2 t + \cos^2 t$$

$$\tan^2 t \cos^2 t + \cos^2 t = \frac{\sin^2 t}{\cos^2 t} \cos^2 t + \cos^2 t = \sin^2 t + \cos^2 t = 1$$

<u>Assessment:</u>

Pg 460 #1-13 (odd)