Precalculus
Section 4.3
Objective: learn the six basic trigonometric functions

Sep 11-2:57 PM

91, 65, 63, 81

$r = 6378\text{km}$ $S = 450\text{km}$

$S = r\theta$

$\frac{450}{6378} = \frac{6378\theta}{6378}$

$\frac{180}{\pi} \times .0705... = \theta$

Aug 25-10:32 AM

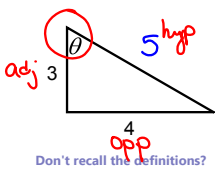
WARM UP

SOH CAH TOA

Use the Pythagorean Theorem to find the hypotenuse of the triangle shown. Then, find the following ratios (using the same triangle):
$\sin\theta, \cos\theta, and \tan\theta$

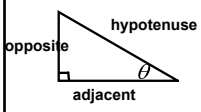
$a^2 + b^2 = c^2$
$3^2 + 4^2 = c^2$
$9 + 16 = c^2$
$25 = c^2$
$5 = c$

$\sin\theta = \frac{4}{5}$
$\cos\theta = \frac{3}{5}$
$\tan\theta = \frac{4}{3}$



Don't recall the definitions?
Check out the blue box on p. 277

Sep 11-3:00 PM



$\sin\theta = \frac{opp}{hyp}$ $\frac{1}{\sin\theta} = \csc\theta = \frac{hyp}{opp}$

$\cos\theta = \frac{adj}{hyp}$ $\frac{1}{\cos\theta} = \sec\theta = \frac{hyp}{adj}$

$\tan\theta = \frac{opp}{adj}$ $\frac{1}{\tan\theta} = \cot\theta = \frac{adj}{opp}$

Aug 24-3:37 PM

Trig Identities (relationships between trig functions)

Reciprocal identities

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

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

Quotient Identities

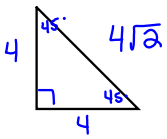
$$\tan u = \frac{\sin u}{\cos u} \quad \cot u = \frac{\cos u}{\sin u}$$

REFERENCE: top of page 280
Use these for Exercises 27-41

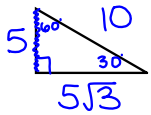
Sep 11-3:20 PM

2 Special Triangles:

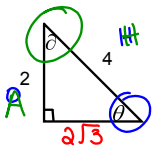
45-45-90



30-60-90



Sep 11-3:11 PM



Find the 6 trigonometric functions of the angles.

$\sin\theta = \frac{2}{4} = \frac{1}{2}$ $\quad \sin\alpha = \frac{2\sqrt{3}}{4} = \frac{\sqrt{3}}{2}$

$\cos\theta = \frac{2\sqrt{3}}{4} = \frac{\sqrt{3}}{2}$ $\quad \cos\alpha = \frac{2}{4} = \frac{1}{2}$

$\tan\theta = \frac{2}{2\sqrt{3}} = \frac{1}{\sqrt{3}} = \frac{\sqrt{3}}{3}$ $\quad \tan\alpha = \frac{2\sqrt{3}}{2} = \sqrt{3}$

$\csc\theta = \frac{2}{1} = 2$ $\quad \csc\alpha = \frac{2}{\sqrt{3}} = \frac{2\sqrt{3}}{3}$

$\sec\theta = \frac{2}{\sqrt{3}} = \frac{2\sqrt{3}}{3}$ $\quad \sec\alpha = \frac{2}{1} = 2$

$\cot\theta = \sqrt{3}$ $\quad \cot\alpha = \frac{\sqrt{3}}{3}$

$\alpha = 90 - \theta$

What do you notice??????

$\sin(90-\theta)$

Aug 24-3:37 PM

Co-Function Identities

$$\sin(\frac{\pi}{2} - u) = \cos u \quad \cos(\frac{\pi}{2} - u) = \sin u \quad \tan(\frac{\pi}{2} - u) = \cot u$$

$$\csc(\frac{\pi}{2} - u) = \sec u \quad \sec(\frac{\pi}{2} - u) = \csc u \quad \cot(\frac{\pi}{2} - u) = \tan u$$

REFERENCE: bottom of p. 279

Sep 11-3:53 PM

These angles will help you when we study the Unit Circle more in depth. So take note:

These angles are supah important.

You can refer to the blue box on p. 279 for help if necessary.

Sep 11-3:16 PM

What's theta when...

$\sec\theta = 2$

$\frac{1}{\cos\theta} = \frac{2}{1}$

$\cos\theta = \frac{1}{2}$

$\theta = \cos^{-1}\left(\frac{1}{2}\right)$

$\theta = 60^\circ$

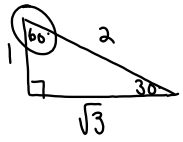
Sep 11-3:17 PM

Let's try. Find the trigonomtric identities given...

$\tan 30^\circ = \frac{\sqrt{3}}{3}, \sin 30^\circ = \frac{1}{2}$

$\csc 30^\circ = 2$ $\quad\quad$ $\cot 60^\circ = \frac{\sqrt{3}}{3}$

$\cos 30^\circ = \frac{\sqrt{3}}{2}$ $\quad\quad$ $\cot 30^\circ = \sqrt{3}$



$\frac{1}{\sqrt{3}} \cdot \frac{\sqrt{3}}{\sqrt{3}} = \frac{\sqrt{3}}{3}$

Sep 11-3:34 PM

Pythagorean Identities

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

Let's verify (Prove by a proof)

a) $\cot^2\theta = \frac{1}{\sin^2\theta} - 1$

$\frac{\cos^2\theta}{\sin^2\theta}$

$\frac{1-\sin^2\theta}{\sin^2\theta}$

$\frac{1}{\sin^2\theta} - \frac{\sin^2\theta}{\sin^2\theta}$

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

b) $(\sec\theta + \tan\theta)(\sec\theta - \tan\theta) = 1$

$\sec^2\theta - \sec\theta\tan\theta + \sec\theta\tan\theta - \tan^2\theta$

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

$1 = 1$ ✓

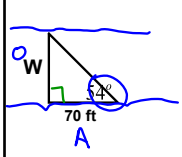
Sep 11-3:43 PM

Evaluate

a) $\sec(5°40'12")$ **b)** $\csc(34°30'36")$

Aug 24-4:09 PM

A biologist wants to know the width W of a river in order to properly set instruments for studying the pollutants in the water.

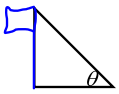


$70\tan 54° = \frac{W}{70}$ 70

$W = 96.35$

Aug 24-4:12 PM

A 12-meter flagpole casts a 12-meter shadow, as shown in the figure. Find θ, the angle of elevation to the sun.



Aug 24-4:15 PM

HOMEWORK

...become trig function MASTERS!

4.3 (p. 284): 1, 9, 13, 27-45(odd), 49-59(odd), 69, 71, 79, 81

Sep 11-3:47 PM