

Student Workbook

The Other Trigonometric Functions

Name: _____

Date: _____

Period: _____

Learning Target: I can find values of tangent, cotangent, secant, and cosecant, and identify where they are undefined.

Vocabulary

Term	Meaning
Tangent	$\tan\theta = \sin\theta / \cos\theta$
Cotangent	$\cot\theta = \cos\theta / \sin\theta = 1/\tan\theta$
Secant	$\sec\theta = 1/\cos\theta$
Cosecant	$\csc\theta = 1/\sin\theta$

Key Concept: Quotient & Reciprocal Identities

FOUR KEY RELATIONSHIPS $\tan\theta = \sin\theta/\cos\theta$ $\cot\theta = 1/\tan\theta = \cos\theta/\sin\theta$
 $\sec\theta = 1/\cos\theta$ $\csc\theta = 1/\sin\theta$

EXAMPLE 1
Find $\tan(\pi/3)$ using $\sin(\pi/3)=\sqrt{3}/2$ and $\cos(\pi/3)=1/2$.
 $\tan(\pi/3) = (\sqrt{3}/2) \div (1/2) = \rule{1.5cm}{0.4pt}$

EXAMPLE 2
Find $\sec(\pi/4)$ using $\cos(\pi/4)=\sqrt{2}/2$.
 $\sec(\pi/4) = 1 \div (\sqrt{2}/2) = \rule{1.5cm}{0.4pt}$

Key Concept: Finding All Four from sin & cos

EXAMPLE 3

Given $\sin\theta=3/5$, $\cos\theta=-4/5$ (Quadrant II), find $\tan\theta$, $\csc\theta$, $\sec\theta$, $\cot\theta$.

$$\tan\theta = (3/5) \div (-4/5) = \underline{\hspace{2cm}} \quad \csc\theta = 1 \div (3/5) = \underline{\hspace{2cm}}$$

$$\sec\theta = 1 \div (-4/5) = \underline{\hspace{2cm}} \quad \cot\theta = (-4/5) \div (3/5) = \underline{\hspace{2cm}}$$

COMMON MISTAKE

$\cot\theta$ is NOT $1/\cos\theta$! That's $\sec\theta$. Remember: $\cot\theta = 1/\tan\theta = \cos\theta/\sin\theta$.

Key Concept: Where Are They Undefined?

DIVISION BY ZERO $\tan\theta$ and $\sec\theta$ are undefined where $\cos\theta=0$ ($\theta = \pi/2 + n\pi$).
 $\cot\theta$ and $\csc\theta$ are undefined where $\sin\theta=0$ ($\theta = n\pi$).

Guided Practice — Part A: Tangent & Cotangent

A1 Find $\tan(\pi/6)$ and $\cot(\pi/6)$.

A2 Find $\tan(2\pi/3)$ and $\cot(2\pi/3)$.

Guided Practice — Part B: Secant & Cosecant

B1 Find $\sec(\pi/3)$ and $\csc(\pi/3)$.

B2 Find $\sec(5\pi/6)$ and $\csc(5\pi/6)$.

Guided Practice — Part C: All Four from sin & cos

C1 Given $\sin\theta=5/13$, $\cos\theta=12/13$ (Q1), find $\tan\theta$, $\csc\theta$, $\sec\theta$, $\cot\theta$.

C2 Given $\sin\theta=-8/17$, $\cos\theta=15/17$ (Q4), find $\tan\theta$, $\csc\theta$, $\sec\theta$, $\cot\theta$.

Guided Practice — Part D: Undefined Values

D1 For what values of θ in $[0, 2\pi)$ is $\tan\theta$ undefined?

D2 For what values of θ in $[0, 2\pi)$ is $\csc\theta$ undefined?

BEFORE YOU MOVE ON

Check with a partner: did you use sin/cos ratios (not just memorized values) to double-check each of your four answers?