

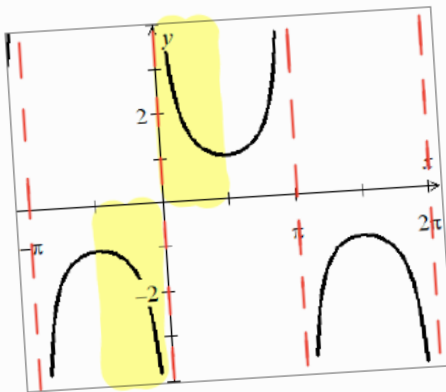
Precalculus Honors

More Inverse Trigonometric Functions

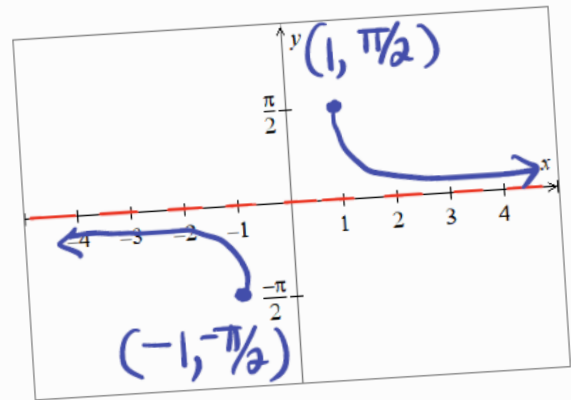


Graph the Inverse Trig Functions

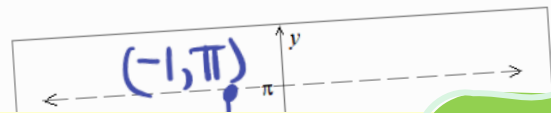
#1: Use a calculator to sketch the remaining inverse trigonometric functions.



$$y = \csc x, -\frac{\pi}{2} \leq x < 0, 0 < x \leq \frac{\pi}{2}$$



$$y = \csc^{-1}(x) \quad y = \operatorname{arc} \csc(x)$$



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4.9

Lesson 9: More Inverse Trigonometric Functions

A Word About Notation

Inverse trigonometric functions may be expressed in arc form or exponent form. Let's explore the two forms:

Exponent Notation	Arc Notation
Verbally, $\sec^{-1}(2)$ means the angle whose secant is 2. Also, it can be thought about as the angle whose cosine is $\frac{1}{2}$.	Verbally, $\csc^{-1}(1)$ means the radian measure of the arc on a circle that corresponds to the value where cosecant is 1.
$\csc^{-1}(x) = \sin^{-1}\left(\frac{1}{x}\right)$	$\arcscsc(x) = \arcsin\left(\frac{1}{x}\right)$
$\sec^{-1}(x) = \cos^{-1}\left(\frac{1}{x}\right)$	$\arcsec(x) = \arccos\left(\frac{1}{x}\right)$
$\cot^{-1}(x) = \begin{cases} \tan^{-1}\left(\frac{1}{x}\right); x > 0 \\ \tan^{-1}\left(\frac{1}{x}\right) + \pi; x < 0 \\ \frac{\pi}{2}; x = 0 \end{cases}$ Also, $\cot^{-1}(x) = \frac{\pi}{2} - \tan^{-1}(x)$	Caution: This formula does not take into consideration those angles where cotangent is zero. So, the previous formula is preferred.

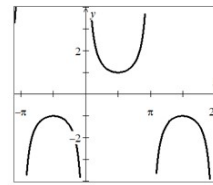
Inverse Properties

Recall from our earlier studies that it is necessary to restrict the domains for secant, cosecant, and cotangent in order to create a one-to-one relationship.

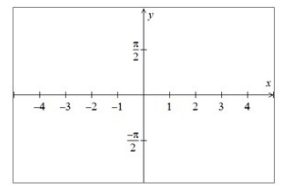
Function:	Domain:	Range:
$y = \csc^{-1}x$	$(-\infty, -1] \cup [1, \infty)$	$\left[-\frac{\pi}{2}, 0\right) \cup \left(0, \frac{\pi}{2}\right]$
$y = \sec^{-1}x$	$(-\infty, -1] \cup [1, \infty)$	$\left(0, \frac{\pi}{2}\right) \cup \left(\frac{\pi}{2}, \pi\right]$
$y = \cot^{-1}x$	$(-\infty, \infty)$	$(0, \pi)$

Graph the Inverse Trig Functions

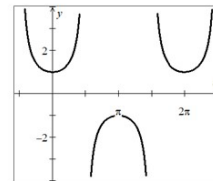
EX #1: Use a calculator to sketch the remaining inverse trigonometric functions.



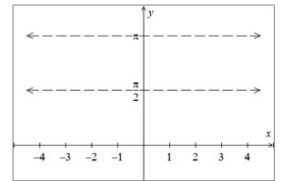
$$y = \csc x, -\frac{\pi}{2} < x < \frac{\pi}{2}, 0 < x \leq \frac{\pi}{2}$$



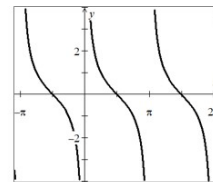
$$y = \csc^{-1}(x) \quad y = \arcscsc(x)$$



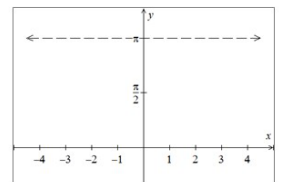
$$y = \sec x, 0 < x < \frac{\pi}{2}, \frac{\pi}{2} < x \leq \pi$$



$$y = \sec^{-1}(x) \quad y = \arcsec(x)$$



$$y = \cot x, 0 < x < \pi$$



$$y = \cot^{-1}(x) \quad y = \arccot(x)$$

Finding Exact Values

EX #2: Find the exact value for each of the following.

A. $\arccsc(2)$

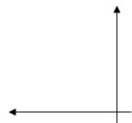
B. $\sec^{-1}(-\sqrt{2})$

C. $\cot^{-1}(-\sqrt{3})$

D. $\arccot(1)$

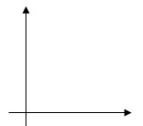
Finding Approximate Values

EX #3: Find the value of $\arccsc\left(-\frac{3}{2}\right)$

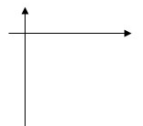


Exact Values of Composite Functions

EX #5: Find the exact value of $\csc\left(\cot^{-1}\frac{1}{2}\right)$



EX #6: Find the exact value of $\sec(\csc^{-1}(-2))$



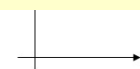
Approximating the Value of Inverse Trigonometric Functions

EX #7: Use a calculator to approximate each expression in radians rounded to three decimal places. Then, convert to degree measure rounded to the nearest hundredth. If not defined, explain why.

A. $\sec^{-1}(4)$

C. $\arccsc\left(\frac{1}{2}\right)$

NOTES



4.9

More Inverse
Trigonometric Functions
Homework

Name _____

Date _____ Period _____

Problems 1 – 6, Find the value of each expression.

1. $\csc^{-1}(1)$

2. $\sec^{-1}(\sqrt{2})$

3. $\arccot(-\sqrt{3})$

4. $\arccsc(-\sqrt{2})$

5. $\cot^{-1}\left(\frac{\sqrt{3}}{3}\right)$

6. $\operatorname{arcsec}(-2)$

Problems 7 – 12, Find the exact value for each composite function.

7. $\sec\left(\arccsc\left(\frac{\sqrt{5}}{2}\right)\right)$

8. $\csc(\cot^{-1}(1))$

9. $\sec(\csc^{-1}\sqrt{3})$

10. $\cot(\operatorname{arcsec}(-2))$

11. $\csc(\operatorname{arccot}(-3))$

12. $\cot\left(\sec^{-1}\frac{2\sqrt{3}}{3}\right)$

Problems 13 – 16, Find the angle measure for each expression, do not use a calculator.

13. $\sec^{-1}\left[\csc\left(\frac{7\pi}{6}\right)\right]$

14. $\cot^{-1}[\sec(\pi)]$

15. $\csc^{-1}\left[\cot\left(\frac{3\pi}{4}\right)\right]$

16. $\operatorname{arcsec}[\cot(\pi)]$

Problems 17 – 22, Use a calculator to approximate each expression in radians rounded to three decimal places. Then, convert to degree measure rounded to the nearest hundredth. If not defined, explain why.

17. $\csc^{-1}(5)$

18. $\operatorname{arcsec}(-4)$

19. $\arccot(\sqrt{5})$

20. $\sec^{-1}(6.75)$

21. $\operatorname{arccsc}\left(\frac{2}{3}\right)$

22. $\cot^{-1}(-\sqrt{10})$

Free-Response Questions

23. Use the function, given $g(x) = \tan\left(x - \frac{3\pi}{2}\right) + 4$ to complete the following.A. What is the domain and range of $g(x)$?B. Find the inverse function, $g^{-1}(x)$. Show your work to support the answer.C. State the domain and range of $g^{-1}(x)$ 24. Use a right triangle to write the trigonometric expression $\sin(\tan^{-1}(x))$ as an algebraic expression.

Practice Sets

A. $\csc^{-1}\left(\csc\frac{\pi}{3}\right) = \frac{\pi}{3}$

B. $\csc^{-1}\left(\csc\frac{5\pi}{3}\right) = \frac{5\pi}{3}$

Lesson Warm-Ups

4.9 More Inverse Trig Functions Form A Name _____ Date _____ Period _____ 1. Evaluate: $\arccot(-1)$ 2. Evaluate: $\csc(\sec^{-1}(-1))$ 3. Evaluate: $\sec\left(\arccot\frac{\sqrt{3}}{3}\right)$ 4. Use a calculator; find the degree measure rounded to two decimal places. $\sec^{-1}(3.5)$ Grade: _____	4.9 More Inverse Trig Functions Form B Name _____ Date _____ Period _____ 1. Evaluate: $\arccsc(-2)$ 2. Evaluate: $\sec(\cot^{-1}(-1))$ 3. Evaluate: _____ 4. Use a calculator; find the degree measure rounded to two decimal places. _____ Grade: _____
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Name _____ Date _____ Period _____	
Lesson 4.9 - More Inverse Trigonometric Functions Warm-Up # 1	
1. Evaluate: $\operatorname{arcsec}(-2)$	2. Evaluate: $\sec(\csc^{-1}(-1))$
3. Evaluate: $\csc\left(\arccot\frac{\sqrt{3}}{3}\right)$	4. Use a calculator; find the degree measure rounded to two decimal places. $\csc^{-1}(2.5)$

Name _____ Date _____ Period _____	
Lesson 4.9 - More Inverse Trigonometric Functions Warm-Up # 2	
1. Evaluate: $\operatorname{arccot}(\sqrt{3})$	2. Evaluate: $\csc(\cot^{-1}(-1))$

Daily Lesson Quiz

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