Name Student

Acc Alg 2 period 2

AMDG

14.4 Notes

Ms. Kresovic

Date 6 Apr 2016

What do we already know?

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

These are called "Reciprocal Identities".

$sinB = \frac{O}{H}$ $cosB = \frac{A}{H}$ $tanB = \frac{O}{A}$ $\left(\frac{sinB}{cosB} = \frac{O}{H} \div \frac{H}{A}\right)$

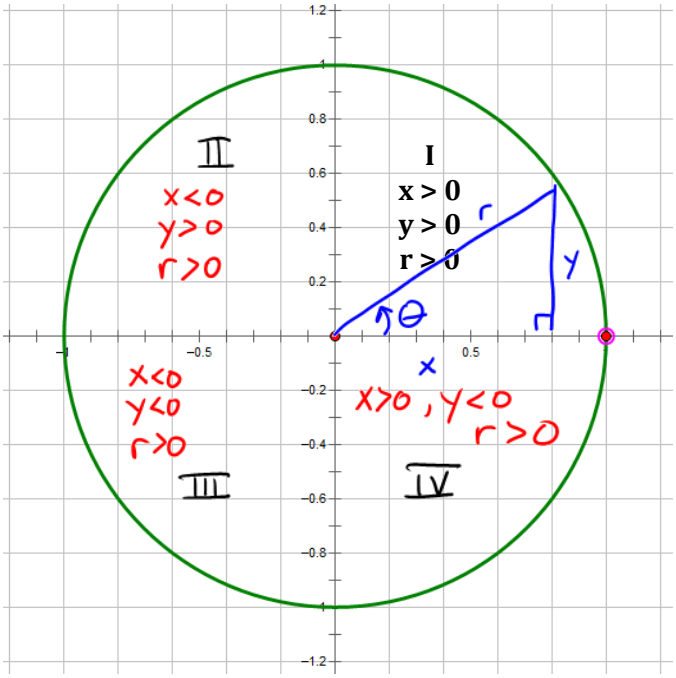
And these are "Quotient Identities"

$tan\theta = \frac{sin\theta}{cos\theta}$ $cot\theta = \frac{cos\theta}{sin\theta}$

CAUTION:

$\frac{1}{sin\theta} \neq sin^{-1}\theta$.

$sin^{-1}\theta = arcsin\theta$ (used when we know the ratio but not the angle measure).



We know definitions: IF r=1

$sin\theta = \frac{O}{H} = \frac{y}{r} = y$ $csc\theta = \frac{r}{y} = \frac{1}{y}$

$cos\theta = \frac{A}{H} = \frac{x}{r} = x$ $sec\theta = \frac{r}{x} = \frac{1}{x}$

$tan\theta = \frac{O}{A} = \frac{y}{x} = \frac{y}{x}$ $cot\theta = \frac{x}{y} = \frac{x}{y}$

Signs of function values

θ in Quad	$\sin\theta$	$\cos\theta$	$\tan\theta$	$\csc\theta$	$\sec\theta$	$\cot\theta$
I	+	+	+	+	+	+
II	+	−	−	+	−	−
III	−	−	+	−	−	+
IV	−	+	−	−	+	−

Can $r \leq 0$? Explain. No :(it's the length of the radius.

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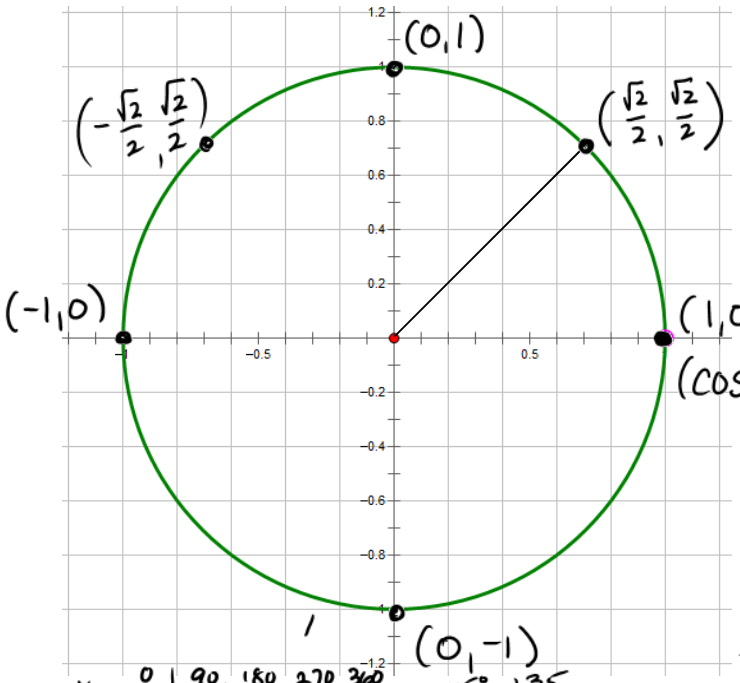
Acc Alg 2 period 2 Date _____



What are the possible ranges of each function? Is there a minimum and maximum value that each function can have? see pg 686

$-1 \le \cos\theta \le 1$

$-1 \le \sin\theta \le 1$

$-\infty \le \tan\theta \le \infty$

$\tan\theta = \frac{\sin\theta}{\cos\theta}$ $\tan\theta = \frac{\pm 1}{\text{close to 0}}$

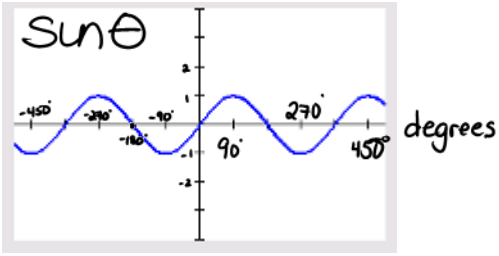
θ	0	90	180	270	360
cosθ	1	0	-1	0	1

$\tan\theta = \frac{\sin\theta}{\cos\theta} = \frac{y}{x}$

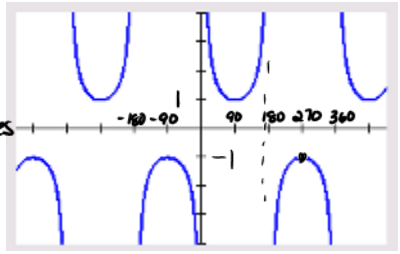
θ	0	90	180	270	360	45°	135
	0	U	0	U	0	1	-1

Using the circle graph (above), make inferences about the graphs of the trigonometric functions on the Cartesian plane. Justify your choices. Label the axes. (This is really beyond our curriculum at this point. I just think it's fun. It's also helpful to make connections. You are responsible for the circle graphs, not Cartesian.)

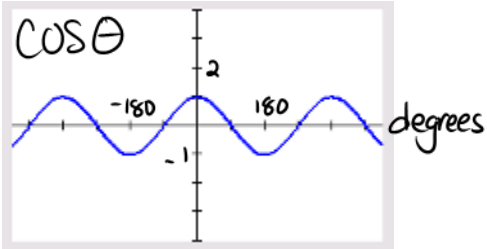
sinθ



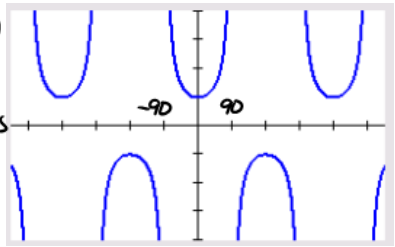
cscθ



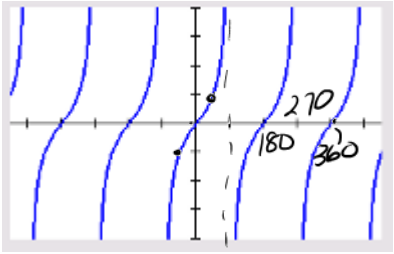
cosθ



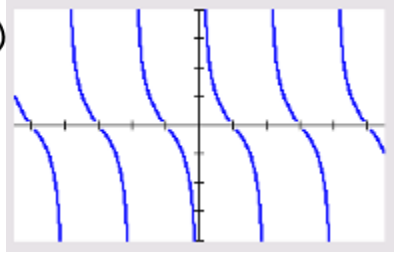
secθ



tanθ



cotθ



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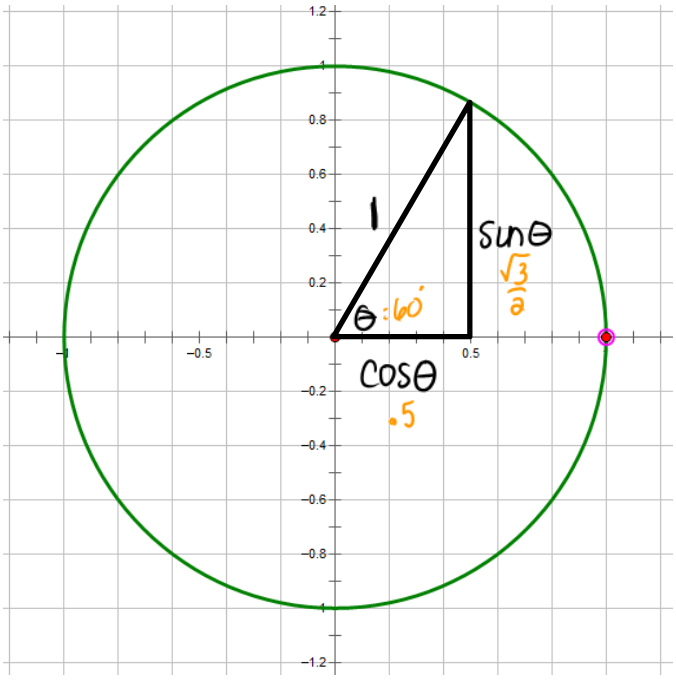
Name_____ 14.4 Notes Ms. Kresovic

Acc Alg 2 period 2 Date _____



Pythagorean Identities

Let $r = 1$. Then in this right triangle, $x^2 + y^2 = 1$.

$x =$ cosθ & $y =$ sinθ

$\cos^2\theta + \sin^2\theta = 1$

$\left(\frac{1}{2}\right)^2 + \left(\frac{\sqrt{3}}{2}\right)^2$

$\frac{1}{4} + \frac{3}{4} = 1$ true

What if ?!

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

$1 + \tan^2\theta = \sec^2\theta$

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

$\cot^2\theta + 1 = \csc^2\theta$

Name STUDENT AMDG 14.4 Notes Ms. Kresovic

Acc Alg 2 period 2 Date _____

PRACTICE

Use the appropriate reciprocal identity to find each function value. Rationalize denominators when applicable.

1. $\sec\theta$, given $\cos\theta = \frac{2}{3}$ $\sec\theta = 3/2$

5. $\cot\theta$, given $\tan\theta = 5$ $\cot\theta = 1/5$

7. $\cos\theta$, given $\sec\theta = -\frac{5}{2}$ $\cos\theta = -2/5$

9. $\sin\theta$, given $\csc\theta = \frac{\sqrt{8}}{2} = \frac{2\sqrt{2}}{2} = \sqrt{2}$ $\sin\theta = \frac{\sqrt{2}}{2}$

13. $\sin\theta$, given $\csc\theta = 1.42716321$ $\sin\theta = \frac{1}{1.42716321} = .700690708$

15. What's wrong with the following statement? "Find $\sec\theta$, given $\cos\theta = 3/2$."

$\cos\theta > 1$ outside range

Determine the signs of the trigonometric functions of an angle in standard position with the given measure.

19. 74° ++ → $\cos\theta > 0$ & $\sin\theta > 0$ ∴ $\left(\frac{\sin\theta}{\cos\theta} = \tan\theta\right) > 0$ $(\cos\theta, \sin\theta)$ (x, y) This angle is in Quad I, so all are positive.

23. 178° −+ This angle is in Quad II. $\sin\theta, \csc\theta$ are positive; $\cos\theta, \sec\theta, \tan\theta, \cot\theta$ are negative.

26. -15° +− This angle is in Quad IV. $\cos\theta, \sec\theta$ are positive; all others are negative.

Identify the quadrant (or possible quadrants) of an angle θ that satisfies the given conditions.

31. $\sin\theta > 0$, $\csc\theta > 0$ I & II

35. $\tan\theta < 0$, $\cos\theta < 0$ II

Decide whether each statement is possible or impossible for angle θ.

46. $\sin\theta = 3$ F

47. $\cos\theta = -0.96$ T

55. $\cot\theta = -4$ T

58. $\tan\theta = 2$ AND $\cot\theta = -2$ (for the same angle θ)

IF $\tan\theta = 2 \Rightarrow \cot\theta = \frac{1}{2}$ ∴ F

60. Explain why no θ satisfies $\cos\theta = ½$ and $\sec\theta = -2$.

should be recip. These are opp & recip.

Use identities to solve the following.

61. Find $\cos\theta$, given $\sin\theta = 3/5$ and θ is in quadrant II. O H

$\cos\theta = -\frac{4}{5}$

Homework: 14.4: 3, 9, 15, 21, 27, 33, 39, 45, 51, 57, 63, 69, 75