Homework 7-6

1a. 5/13 b. 5/13

2. -0.98

3a. ±3/5 b. Depends on what quadrant θ is in. c. 4/5

4. -3/5

5a. 0.8 b. -0.8, 323.1°

6. No. ex: sin(90) ≠ sin(30) + sin(60), 1≠1.366

7. 28.9"

Name: Key

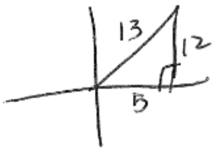
Period :

Algebra 2 Homework 7-6

1. On a unit circle, $\sin(\theta) = \frac{12}{13}$ and θ is acute. What is the exact values of $\cos(\theta)$?

   QI

   a. Find your answer by drawing the triangle in the correct quadrant in standard position.



$\cos(\theta) = \frac{5}{13}$

   b. Find your answer using the Pythagorean Identity.

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

$\left(\frac{12}{13}\right)^2 + \cos^2\theta = 1$

$\frac{144}{169} + \cos^2\theta = \frac{169}{169}$

$\sqrt{\cos^2\theta} = \sqrt{\frac{25}{169}}$

$\cos\theta = \pm\frac{5}{13}$

QI $\cos(+)$ $+\frac{5}{13}$

2. Using the identity $\sin^2(\theta) + \cos^2(\theta) = 1$, find the value of $\tan(\theta)$, to the nearest hundredth, if $\sin(\theta)$ is 0.7 and θ is in Quadrant II. **(Regents question)**

$(.7)^2 + \cos^2\theta = 1$

$.49 + \cos^2\theta = 1$

$\sqrt{\cos^2\theta} = \sqrt{.51}$

$\cos\theta = \pm .714$

QII $\cos\theta < 0$

$\therefore \cos(\theta) = -.714$

$\tan(\theta) = \frac{\sin(\theta)}{\cos(\theta)} = \frac{.7}{-.714} = -.98$

3. a. If $\cos(\theta) = \frac{4}{5}$, what are **two** possible values for $\sin(\theta)$?

$\sin^2\theta + \left(\frac{4}{5}\right)^2 = 1$

$\sin^2\theta + \frac{16}{25} = \frac{25}{25}$

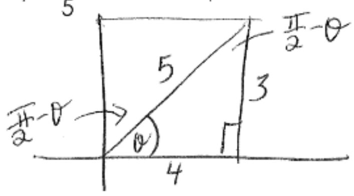
$\sqrt{\sin^2\theta} = \sqrt{\frac{9}{25}}$

$\sin(\theta) = \pm\frac{3}{5}$

   b. Why are there two possible values for $\sin(\theta)$?

depends what quadrant the angle is in. QI, II (+) QIII, IV (−)

   c. If $\sin(\theta) = \frac{3}{5}$ and θ is in quadrant I, what is $\sin\left(\frac{\pi}{2} - \theta\right)$?



$90°$

$\sin\left(\frac{\pi}{2} - \theta\right) = \frac{4}{5}$

4. Given $\sin(\theta) = \frac{4}{5}$, and θ is an obtuse angle less than π radians, use the Pythagorean identity to find the exact values of $\cos(\theta)$.

QII

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

$\left(\frac{4}{5}\right)^2 + \cos^2\theta = 1$

$\frac{16}{25} + \cos^2\theta = \frac{25}{25}$

$\sqrt{\cos^2\theta} = \sqrt{9/25}$

$\cos(\theta) = \pm 3/5$

QII $\cos(\theta) < 0$

$\therefore \cos(\theta) = -3/5$

5. Using the identity $\sin^2(\theta) + \cos^2(\theta) = 1$, if $\sin(\theta)$ is -0.6 and θ is in Quadrant IV,
   a. Find $\cos(\theta)$ to the nearest tenth.

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

$(-.6)^2 + \cos^2\theta = 1$

$\cos^2\theta = .64$

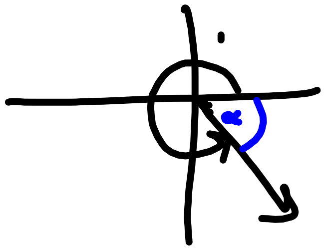
$\cos\theta = \pm .8$

QIV $\cos(\theta) > 0$

$\cos(\theta) = .8$

   b. Find $\tan(\theta)$ and ~~$\cot(\theta)$~~ $m\angle\theta$ to the nearest tenth.

$\tan(\theta) = \frac{\sin(\theta)}{\cos(\theta)} = \frac{-.6}{.8} = -.75 = -.8$



QIV $\alpha = \cos^{-1}(.8) = 36.9°$

$\theta = 360 - 36.7 = 323.1°$

6. Does sin(A+B) = sin(A) + sin(B)? Justify your answer by substituting numbers for A and B.

let $A = 30°$ $B = 60°$

$\sin(30 + 60) \stackrel{?}{=} \sin(30) + \sin(60)$

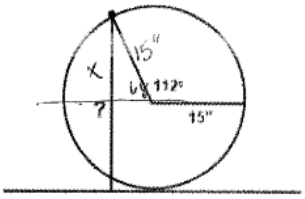
NO

$\sin(90) \stackrel{?}{=} \sin(30) + \sin 60$

$1 \stackrel{?}{=} .5 + .866$

$1 \neq 1.366$

7. A wheel with a dot on its edge rolls on the ground. The radius of the wheel is 15". When the dot is at the position shown below, at an angle of 112°, what is the distance of the dot above the ground, to the nearest tenth of an inch?



$\sin 68° = \frac{x}{15}$

$x = 15 \sin 68 = 13.9''$

$+15$

$28.9''$

Day 7: Reciprocal Functions

secant → $\sec(\theta) = \frac{1}{\cos(\theta)}$ where $\cos(\theta) \neq 0$

cosecant → $\csc(\theta) = \frac{1}{\sin(\theta)}$ where $\sin(\theta) \neq 0$

cotangent → $\cot(\theta) = \frac{1}{\tan(\theta)}$ where $\tan(\theta) \neq 0$

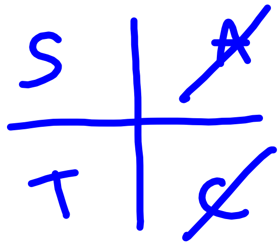
remember: $\tan(\theta) = \frac{\sin(\theta)}{\cos(\theta)}$ $\cot(\theta) = \frac{\cos(\theta)}{\sin(\theta)}$

Reciprocal functions have the same signs.

Reciprocal Function Examples:

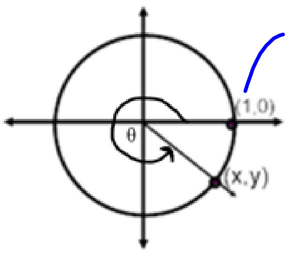
1. If sin(A) = 3/5, then csc(A) = $5/3$
2. If tan(A) = 17/12, then cot(A) = $12/17$
3. a. If cos(A) = -6/9, then sec(A) = $-9/6$.

   b. What quadrant(s) could angle A be in? II, III



4. If cos(A) > 0, which must always be true?
   a. sin(A) > 0
   b. tan(A) > 0
   c. sec(A) > 0
   d. csc(A) > 0

5. Using the unit circle below, explain why csc(θ) = 1/y.



unit circle!

$x = \cos(\theta)$
$y = \sin(\theta)$ } on the unit circle

sin(θ) and csc(θ) are reciprocals of each other

$y = \sin(\theta) \therefore \frac{1}{y} = \csc(\theta)$

<u>Finding Trig Values</u>:

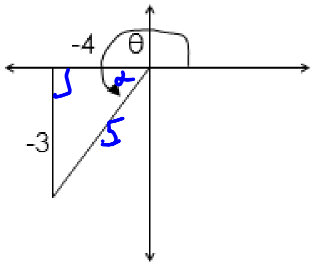
The value of a specific function can be found if you know:

a. coordinates of a point on the terminal side OR

b. another function value & quadrant in which the angle lies.

Note: r = radius of the circle (and hypotenuse), and the radius will always be positive.

1.



Find:

a. r $= 5$

b. $\sin(\theta)$ $-3/5$

c. $\cos(\theta)$ $-4/5$

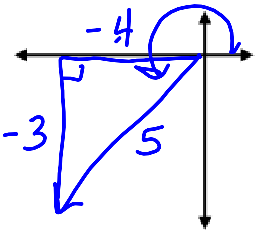
d. $\tan(\theta)$ $\frac{-3}{-4} = \frac{3}{4}$

e. $\csc(\theta)$ $-5/3$

f. $\sec(\theta)$ $-5/4$

g. $\cot(\theta)$ $4/3$

2. If $\tan(\theta) = \frac{3}{4}$ and θ is in Quad III, find $\csc(\theta)$.

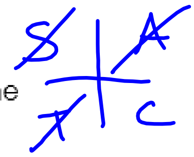


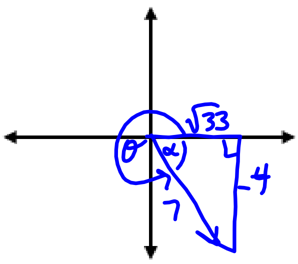
$\sin(\theta) = -3/5$

$\csc(\theta) = -5/3$

3. If $\sin(\theta) = -\frac{4}{7}$ and $\sec(\theta) > 0$, determine the quadrant in which θ lies, sketch the triangle and find the remaining trig functions.

cos(+) IV





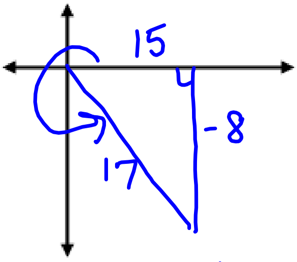
$\sin(\theta) = \underline{-4/7}$ $\csc(\theta) = \underline{-7/4}$

$\cos(\theta) = \underline{\sqrt{33}/7}$ $\sec(\theta) = \underline{7/\sqrt{33}}$

$\tan(\theta) = \underline{-4/\sqrt{33}}$ $\cot(\theta) = \underline{-\sqrt{33}/4}$

$4^2 + x^2 = 7^2$
$16 + x^2 = 49$
$x^2 = 33$
$x = \sqrt{33}$

4. If $\cos(\theta) = \frac{15}{17}$ and θ lies in quadrant IV, sketch the triangle and find the remaining trig functions.



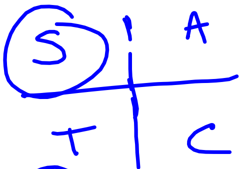
$\sin(\theta) = \underline{-8/17}$ $\csc(\theta) = \underline{-17/8}$

$\cos(\theta) = \underline{15/17}$ $\sec(\theta) = \underline{17/15}$

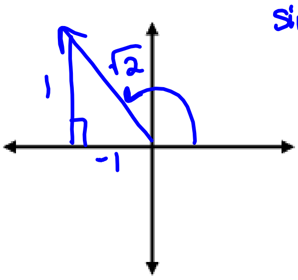
$\tan(\theta) = \underline{-8/15}$ $\cot(\theta) = \underline{-15/8}$

tan (−) $\frac{-1}{1}$ sin +

5. If cot(θ) = -1 and csc(θ) = $\sqrt{2}$, find cos(θ).

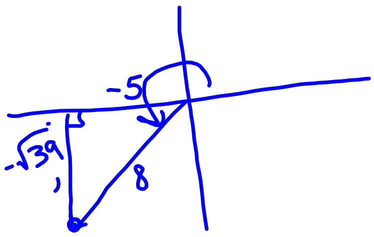


$\sin(\theta) = \frac{1}{\sqrt{2}}\,\frac{o}{h}$



$\cos(\theta) = \frac{-1}{\sqrt{2}}$

6. If the radius of a circle is 8, ∠θ is in quadrant III, and the x-coordinate of a point on the terminal side of ∠θ is -5, find the sin (θ).



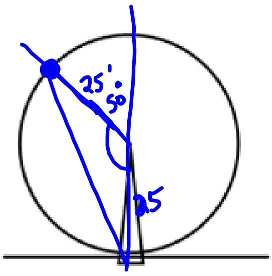
$5^2+y^2=8^2$
$25+y^2=64$
$y^2=39$
$y=\pm\sqrt{39}$

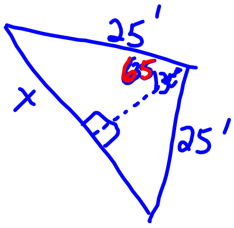
$\frac{-\sqrt{39}}{8}$

7. If the terminal side of ∠θ passes throught the point (6, -7), sketch the angle in standard form and find all of the trig functions.

Application Word Problem:

A passenger boards a Ferris wheel ride directly below the center. The wheel has a radius of 25 feet. His friend takes a picture of him when the wheel has rotated 230° counterclockwise. What is the straight-line distance of the man from his starting position when the picture was taken, rounded to the nearest tenth?





$\sin(65°) = \frac{x}{25}$

$x = 25 \sin 65°$

$x = 22.66$

$\times 2$

$45.3'$