Acc Precalculus

Beginning Trig Study Guide

Unit 4

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10-23-17
3RD

I. The Unit Circle

① **standard position angle**

vertex at origin, initial side on positive x-axis, terminal side measured CCW from initial side

② **unit circle**

circle with a radius of 1

$\cos\theta = x$ value

$\sin\theta = y$ value

→ equation:

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

$$x^2 + y^2 = 1$$

6 trig functions

$\sin\theta$	$\frac{opp}{hyp}$	$\csc\theta$	$\frac{1}{\sin\theta}$ OR $\frac{hyp}{opp}$
$\cos\theta$	$\frac{adj}{hyp}$	$\sec\theta$	$\frac{1}{\cos\theta}$ OR $\frac{hyp}{adj}$
$\tan\theta$	$\frac{opp}{adj}$ OR $\frac{\sin}{\cos}$	$\cot\theta$	$\frac{1}{\tan\theta}$ OR $\frac{\cos}{\sin}$ OR $\frac{adj}{opp}$

③

Q_I $\quad 0° < \theta < 90° \qquad \cos\theta =$ pos +

$\quad 0 < \theta < \frac{\pi}{2} \qquad \sin\theta =$ pos +

Q_{II} $\quad 90° < \theta < 180° \qquad \cos\theta =$ neg −

$\quad \frac{\pi}{2} < \theta < \pi \qquad \sin\theta =$ pos +

degrees w same sine values are supplementary + are reflected over the y axis (their cosine values are opposite signs)

④

Q_{III} $180° < \theta < 270°$ $\cos\theta$ = neg −

$\pi < \theta < \frac{3\pi}{2}$ $\sin\theta$ = neg −

Q_{IV} $270° < \theta < 360°$ $\cos\theta$ = pos +

$\frac{3\pi}{2} < \theta < 2\pi$ $\sin\theta$ = neg −

degrees w same cosine values add to 360° (2π) and are reflected over the x axis (their sine values have opposite signs)

on the unit circle...

$-1 \leq \sin\theta$ and $\cos\theta \leq 1$

↳ so $\sec\theta$ and $\csc\theta$ can never be between −1 and 1

⑤ coterminal angles

angles that share a terminal side

$\theta \pm 360°$ OR $\theta \pm 2\pi$

⑥

$\tan\theta = \frac{\sin\theta}{\cos\theta}$ ⇒ equal to the slope

⑦ Reference angles - acute angles formed by dropping an altitude to the x axis

Q_I: $\theta = \angle r$

Q_{II}: $180° - \theta = \angle r$

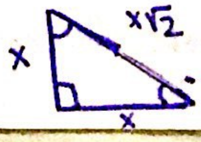
Q_{III}: $\theta - 180° = \angle r$ OR $\theta - \angle r = 180°$

Q_{IV}: $360° - \theta = \angle r$

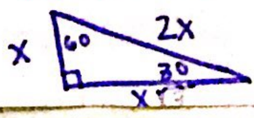
$\sin(B) = \cos(90 - B)$

special triangles

45-45-90



30-60-90



8. if given 1 trig function, use pythagorean theorem to find missing side and then find other trig functions

9. $$1 \text{ Radian} = \frac{\text{arc length}}{\text{radius}}$$

- Radians have no units
- $360° = 2\pi$ radians $= 1$ circle
- 1 radian = a little less than $60°$

degrees to Radians

$$\theta° * \frac{\pi}{180} = \text{Radians}$$

Radians to degrees

$$\theta \text{ Radians} * \frac{180}{\pi} = \text{degrees}$$

* be able to find values of trig functions given a unit circle on graph paper & a protractor

II. Linear and Angular Velocity

→ angular velocity (ω) # of degrees or radians per unit of time $\left(\frac{\theta}{t}\right)$

ex) two objects connected by an axle/straight line have the same angular velocity

→ linear velocity (v) distance per unit of time (d/t)

ex) two objects connected by their edges have the same linear velocity

use dimensional analysis to convert

- 1 Revolution = 2π radians = $360°$ = 1 circumference
- 1 radian = 1 radius

III. Degrees, Minutes, Seconds (DMS)

→ degree °   360 degrees in 1 circle

→ minute ' $\frac{1}{60}$ degree

→ second " $\frac{1}{3600}$ degree

CALCULATOR

$\boxed{\text{2ND}} \to \boxed{\text{apps}}$

ANGLE

1. °
2. '
4. ▸DMS

IV. Trig with a calculator

* UNITS MATTER *

- if problem is in degrees, calculator must be in degrees
- if problem is in radians, calculator must be in radians

- if given a trig function value and you are trying to solve for the angle, use the INVERSE ($^{-1}$)

- temporarily convert to radians in calculator:

  2ND → Apps (angle) → 3 (r)

  *use double parentheses

V. More trig values

$\sin(\pi-\theta) = +\sin\theta$

$\cos(\pi-\theta) = -\cos\theta$

$\tan(\pi-\theta) = -\tan\theta$

$\csc(\pi-\theta) = +\csc\theta$

$\sec(\pi-\theta) = -\sec\theta$

$\cot(\pi-\theta) = -\cot\theta$

$\sin(\theta+\pi) = -\sin\theta$

$\cos(\theta+\pi) = -\cos\theta$

$\tan(\theta+\pi) = +\tan\theta$

$\csc(\theta+\pi) = -\csc\theta$

$\sec(\theta+\pi) = -\sec\theta$

$\cot(\theta+\pi) = +\cot\theta$

$\sin(90-\theta) = \cos\theta$

$\cos(90-\theta) = \sin\theta$

$\tan(90-\theta) = \cot\theta$

$\csc(90-\theta) = \sec\theta$

$\sec(90-\theta) = \csc\theta$

$\cot(90-\theta) = \tan\theta$

$\sin(-\theta) = -\sin\theta$

$\cos(-\theta) = +\cos\theta$

$\tan(-\theta) = -\tan\theta$

$\csc(-\theta) = -\csc\theta$

$\sec(-\theta) = +\sec\theta$

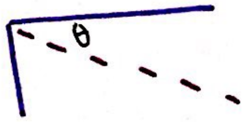
$\cot(-\theta) = -\cot\theta$

Scanned with CamScanner

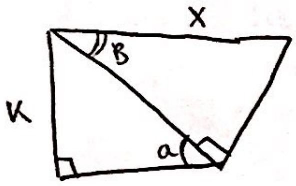
VI. Applications

→ angle of elevation

→ angle of depression



→ solving in terms of x



$$\sin(a) = \frac{K}{h}$$

$$\cos(B) = \frac{h}{x}$$

$$h = \frac{K}{\sin a}$$

$$\cos(B) = \frac{K}{\sin a} \div x$$

$$x\cos(B) = \frac{K}{\sin a}$$

$$\boxed{x = \frac{K}{\sin(a)\cos(B)}}$$