thursday - 10/20
Week 8

TRIGONOMETRY

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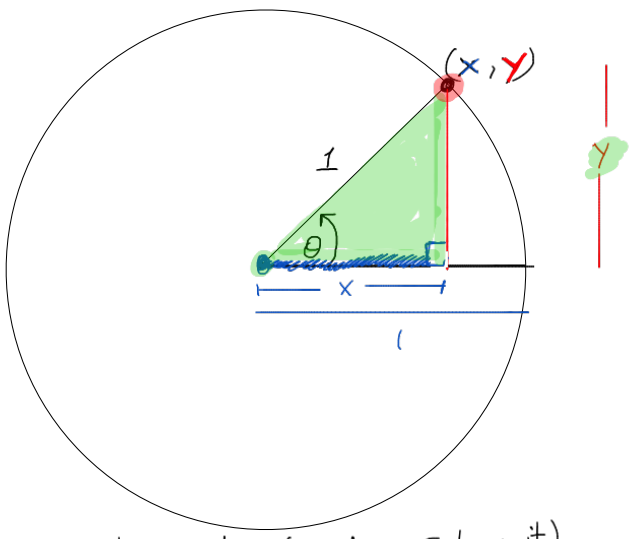
next 3 weeks ⇝ Exam 3 - basic trig

last 3 weeks ⇝ Exam 4 - applied problems.

Def'n: trig: study of ratios

often the 1st definition of $\sin(\theta)$ is $\frac{\text{opposite}}{\text{hypotenuse}}$

we (in calculus) define $\boxed{\sin(\theta) = \frac{y}{1} = y}$ (height of the "terminal point" on unit circle for angle θ) (x, y)



unit circle (radius = 1 unit)

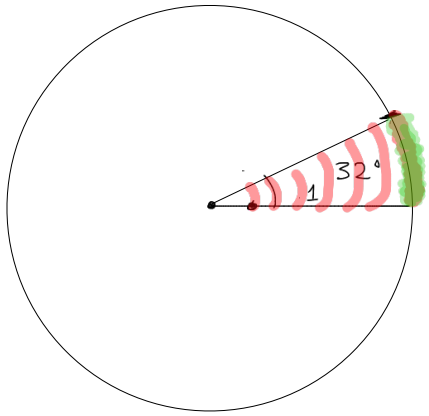
$\cos(\theta)$ = x-coord of the terminal pt on unit circle for angle θ.

$\left(\frac{\text{adjacent}}{\text{hypotenuse}}\right)$

$$\boxed{\tan(\theta) = \frac{\text{opp}}{\text{adj}} = \frac{\sin\theta}{\cos\theta}} = \frac{\left[\frac{\text{opp}}{\text{hyp}}\right]}{\left[\frac{\text{adj}}{\text{hyp}}\right]} = \left[\frac{\text{opp}}{\text{hyp}}\right] \cdot \left[\frac{\text{hyp}}{\text{adj}}\right] = \frac{\text{opp}}{\text{adj}}$$

$$\tan\theta = \frac{y}{x} = \frac{y-0}{x-0} \leftarrow \frac{\text{change in } y}{\text{change in } x} = \text{slope of the line determined by } \theta.$$

$\sin\theta$ = y-coord (on unit circle)	$\csc\theta = \frac{1}{\sin\theta}$ "co-secant"
$\cos\theta$ = x-coord (on unit circle)	$\sec\theta$ "secant" $\frac{1}{\cos\theta}$
$\tan\theta$ = slope	$\cot\theta = \frac{1}{\tan\theta}$



unit circle

Circumference:
$C = 2\pi r$

Area:
$A = \pi r^2$

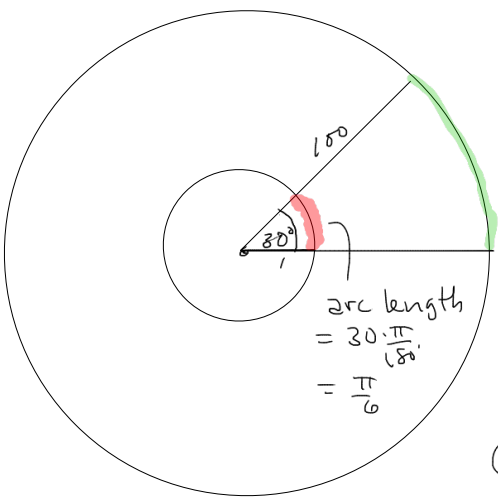
Relationship B/W Angles & Distance

on unit circle the angle (in radian measure)
$180° = \pi$
is the length of the arc subtended by the angle.

Ex $\theta = 32°$. Convert to Radians:

$32° \times \frac{\pi}{180°} = \frac{32 \cdot \pi}{180} \approx .5585$

(just over ½ of a radian)



FACT

ARC LENGTH $S = r\theta$

arc length $= 100 \cdot \frac{\pi}{6}$

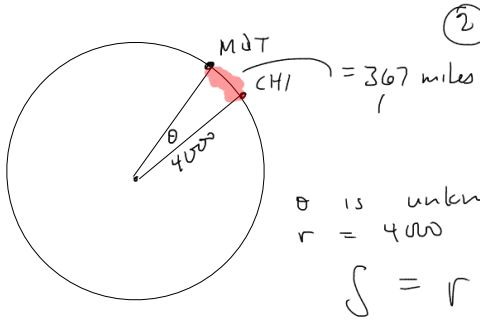
Ex: Earth

$r = 4000$ miles:

① What's circumf. of equator: $C = 2\pi r$
$= 2\pi \cdot 4000$
$= 8000 \cdot \pi \approx 25{,}000$ mi.

② What angle subtends the arc from MQT to Chicago.

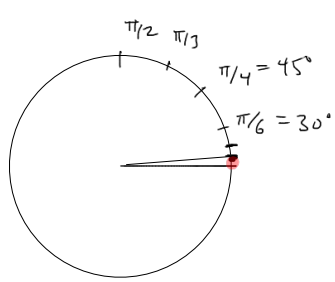
① get arc length b/w MQT, CHI

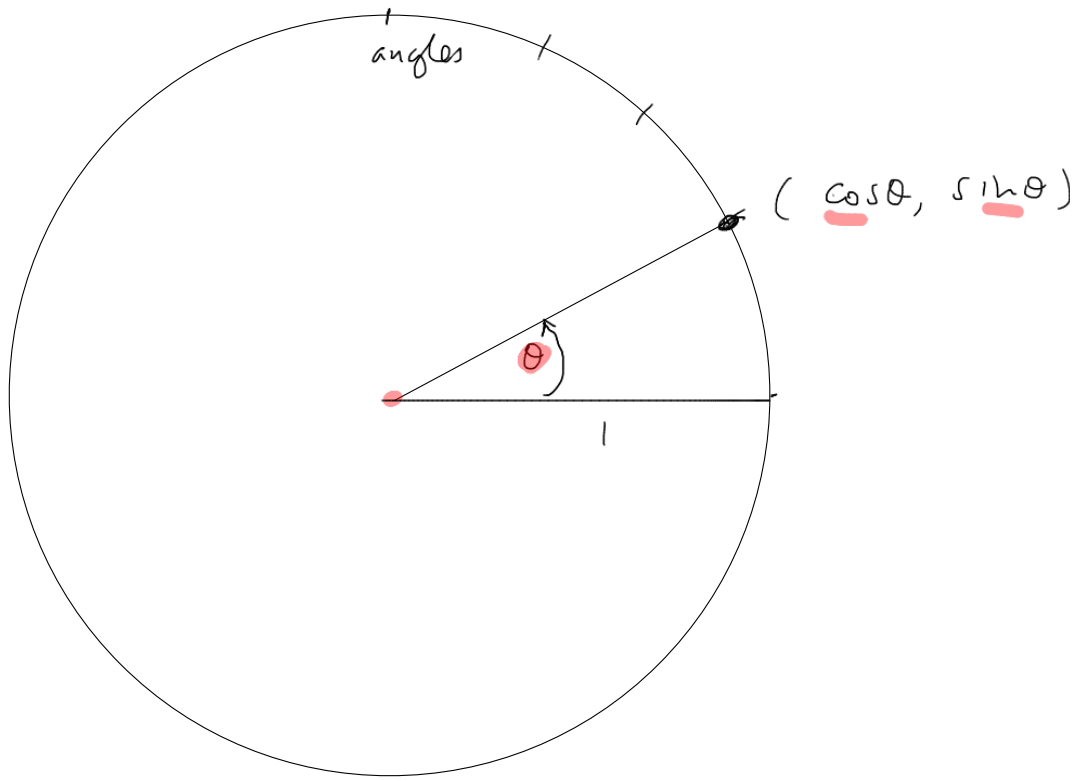


θ is unknown
$r = 4000$ given

$S = r \cdot \theta$

$367 = 4000 \cdot \theta$ so $\theta = \frac{367}{4000} \cdot \frac{180°}{\pi} \approx 5°$




angles
$(\cos\theta, \sin\theta)$
θ
1