Friday, Sept. 16 - Fall '22
Lecture #8

Announcements / Reminders

* WP HW 3 due next Wed — 1.4, 1.5, some 1.6
* Q3 next Thursday — 1.5, 1.6
* E1 on 9/28

Section 1.5 - Trigonometric Functions

Two units of measure for angles
radians and degrees

A circle has 360° or 2π radians
So the conversion factor is

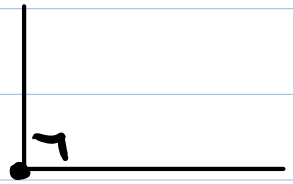
$$\text{degrees} = \frac{360}{2\pi} \cdot \text{radians}$$

$$= \frac{180}{\pi} \cdot \text{radians}$$

The other direction:

$$\text{radians} = \frac{\pi}{180} \cdot \text{degrees}$$

Exs:

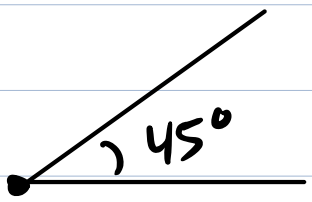


"right angle"

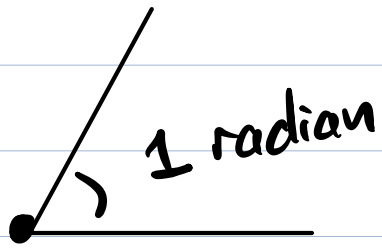
90° $\left(\frac{360}{4}\right)$

How many radians?

$\frac{\pi}{180} \cdot 90 = \frac{\pi}{2}$ radians $\approx \frac{3.1}{2} \approx 1.5$



$45^\circ = \frac{\pi}{4}$ radians



convert to degrees:

$\frac{180}{\pi} \cdot 1 = \left(\frac{180}{\pi}\right)^\circ$

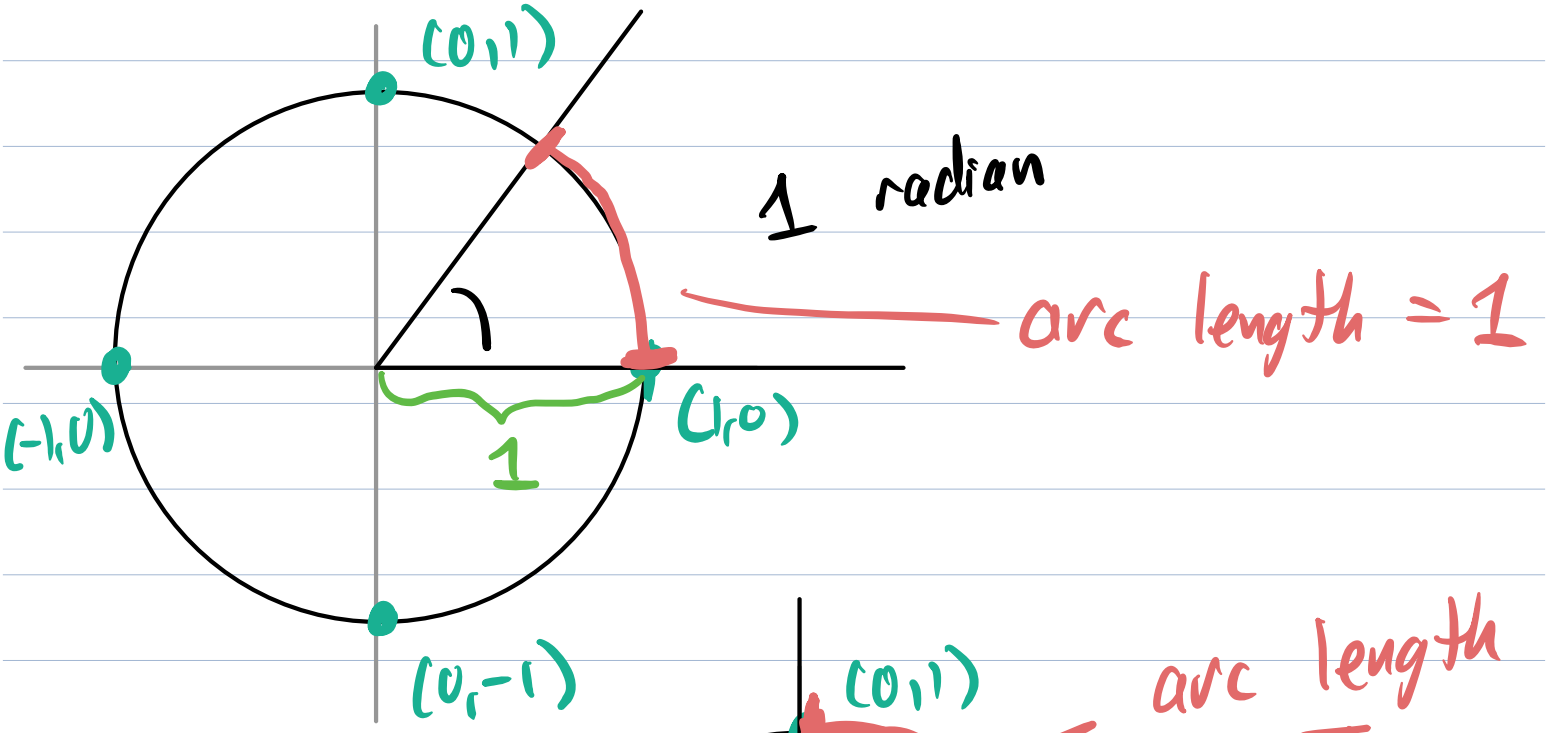
$\approx 57.3^\circ$

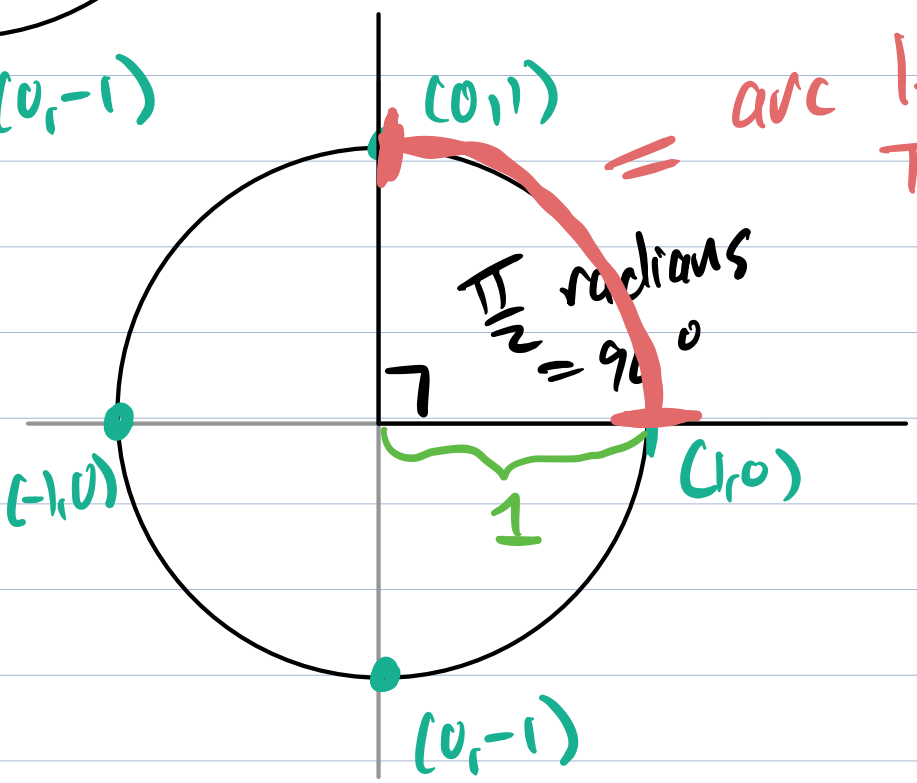
"acute" = less than 90°

"obtuse" = more than 90°

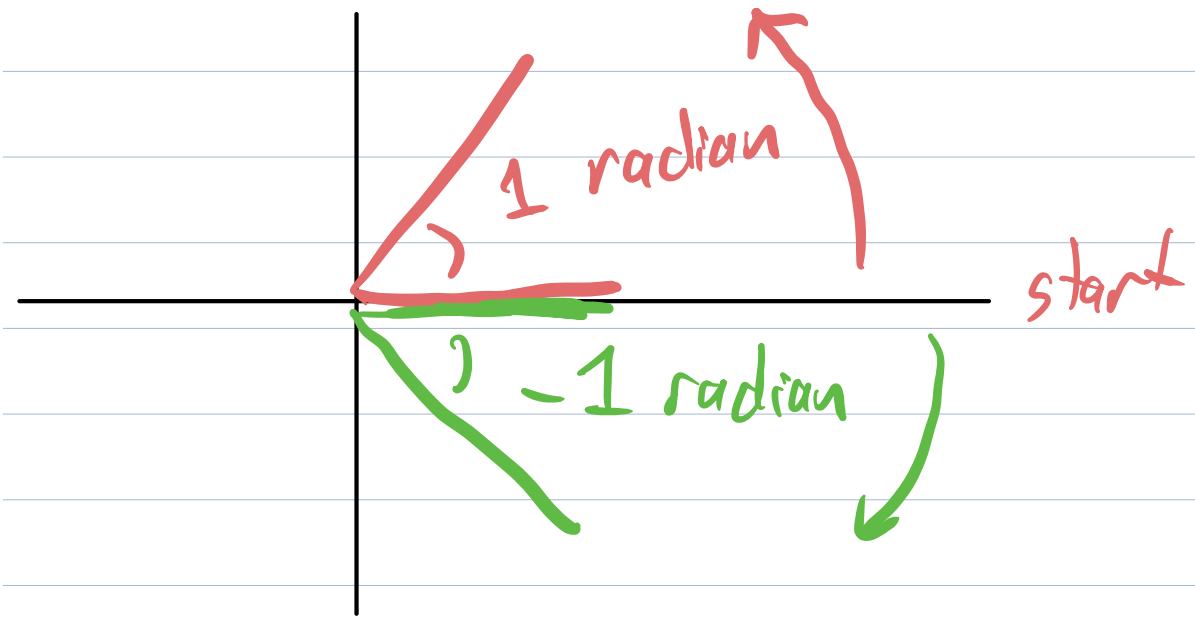
The point of radians is they correspond to <u>arc length</u> for a "<u>unit circle</u>." ↳ a circle with radius 1

full circle = 2π radians
= circumference 2π



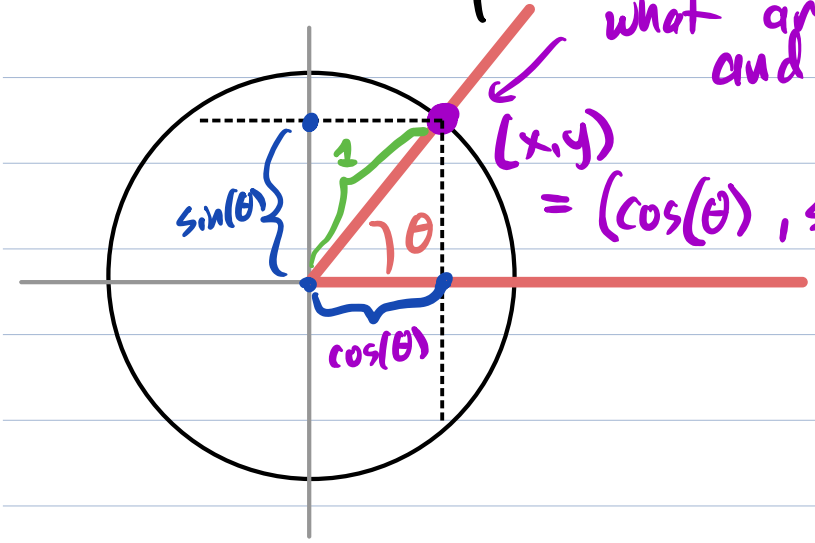


Angles technically a <u>direction</u>. Positive angles go counterclockwise, negative angles go clockwise.

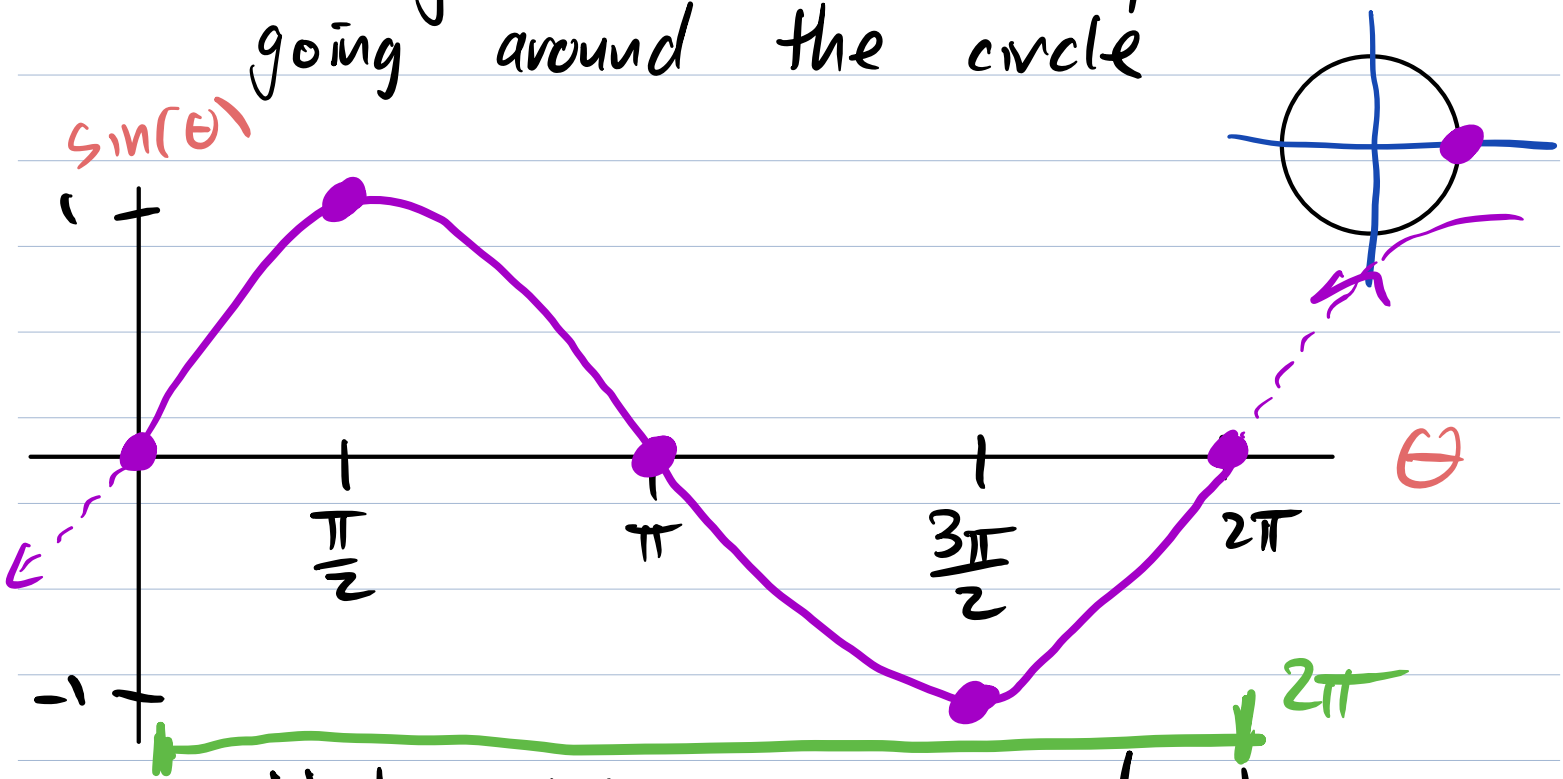


Sine and cosine

As you spin a point around the outside of a circle, the trig functions cosine and sine tell you the x and y coordinates of that point.



$\sin(\theta)$ - y-coordinate of the point going around the circle



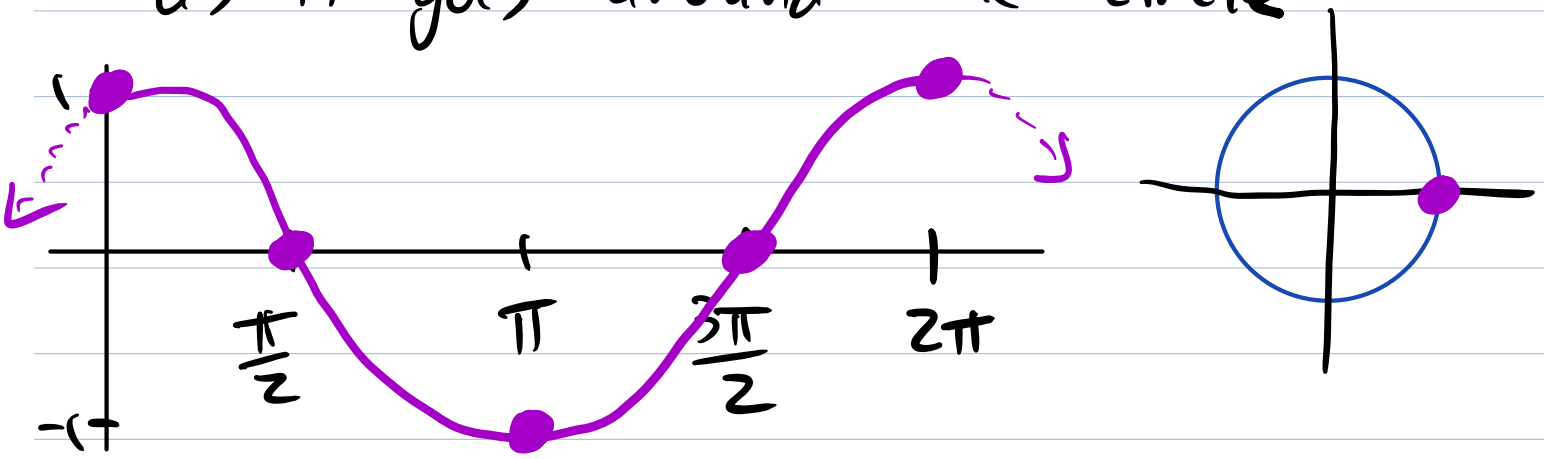
amplitude = distance from the middle height to the highest height

A = 1

period = how long until it repeats

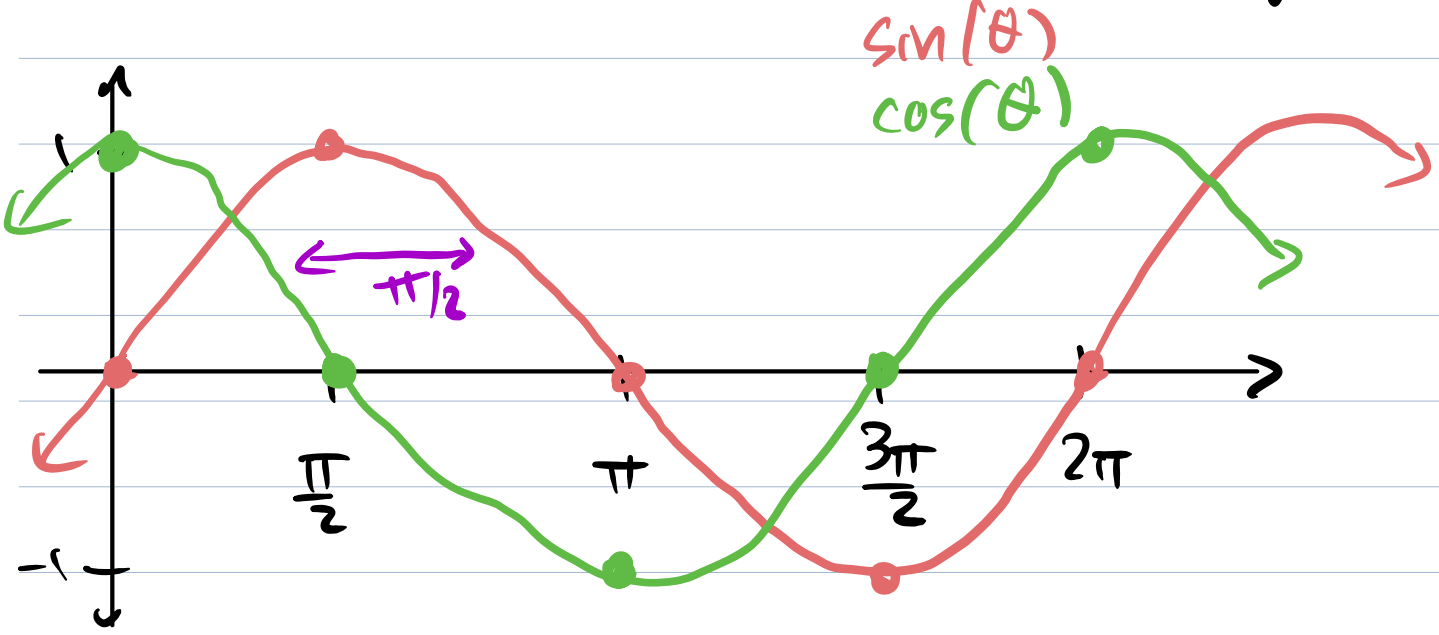
P = 2π

$\cos(\theta)$ - x-coordinate of the point as it goes around the circle



Amplitude = 1 Period = 2π

sin and cos on the same graph



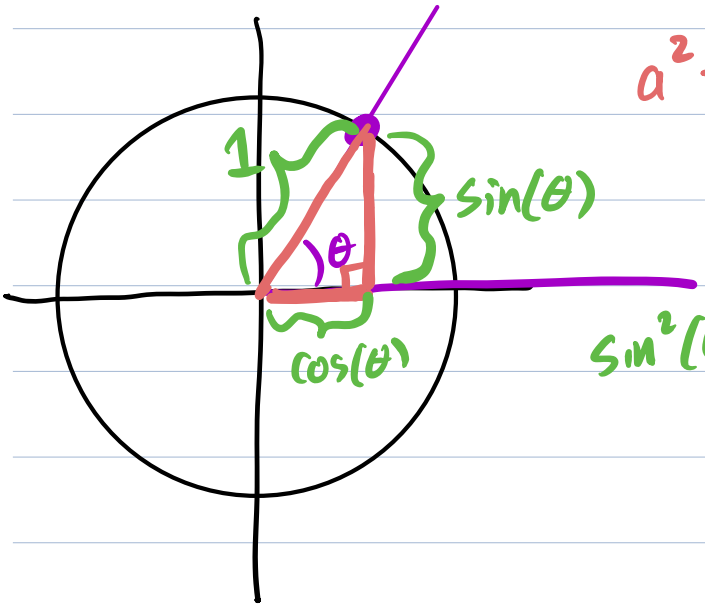
Section 1.3: $\sin(\theta) = \cos\left(\theta - \frac{\pi}{2}\right)$

(book has lots more examples)

Notation Instead of $(\sin(\theta))^2$, it is common to write $\sin^2(\theta)$.
These are different than $\sin(\theta^2)$.

Fact: For any angle θ:

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



$a^2+b^2=c^2$

$\sin^2(\theta)+\cos^2(\theta)=1$ ✓

Sin and cos can be transformed like any other function

$$A \cdot \sin(B \cdot \theta)$$

$|-3| = 3$

$|3| = 3$

amplitude $= |A|$

period $= \frac{2\pi}{|B|}$.