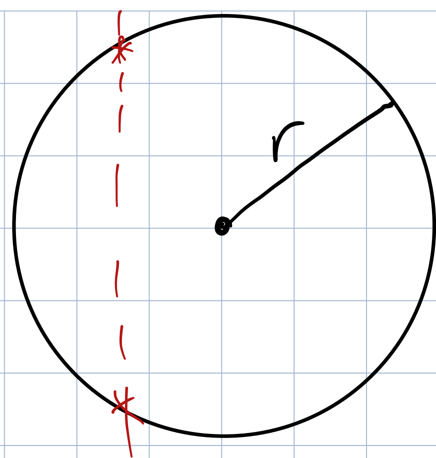
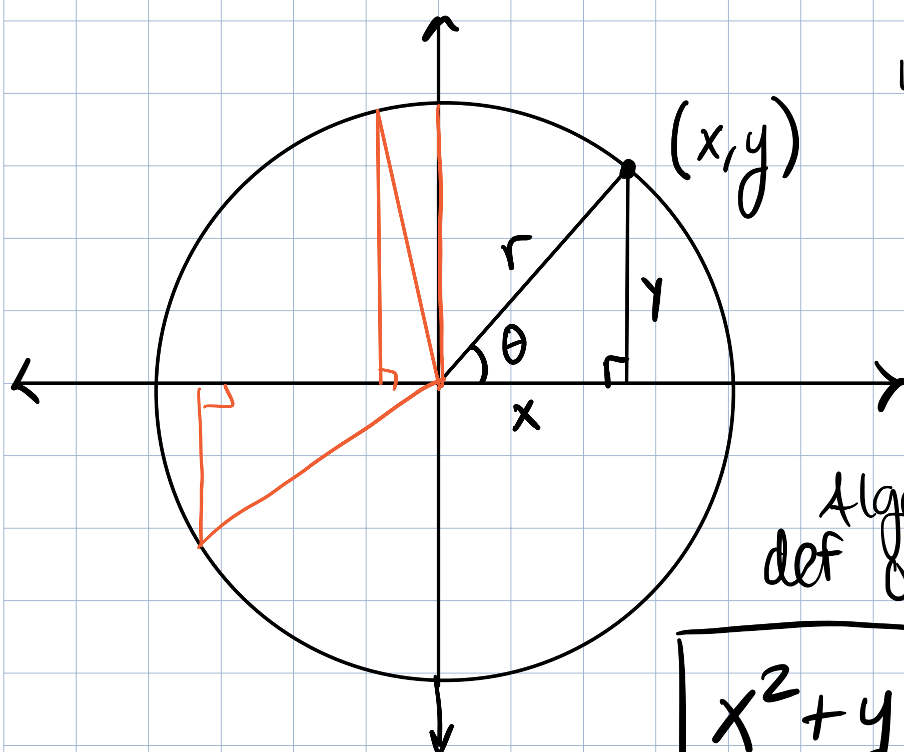


circle is not a function



we can break down a circle using right triangles.

Algebraic def of a circle

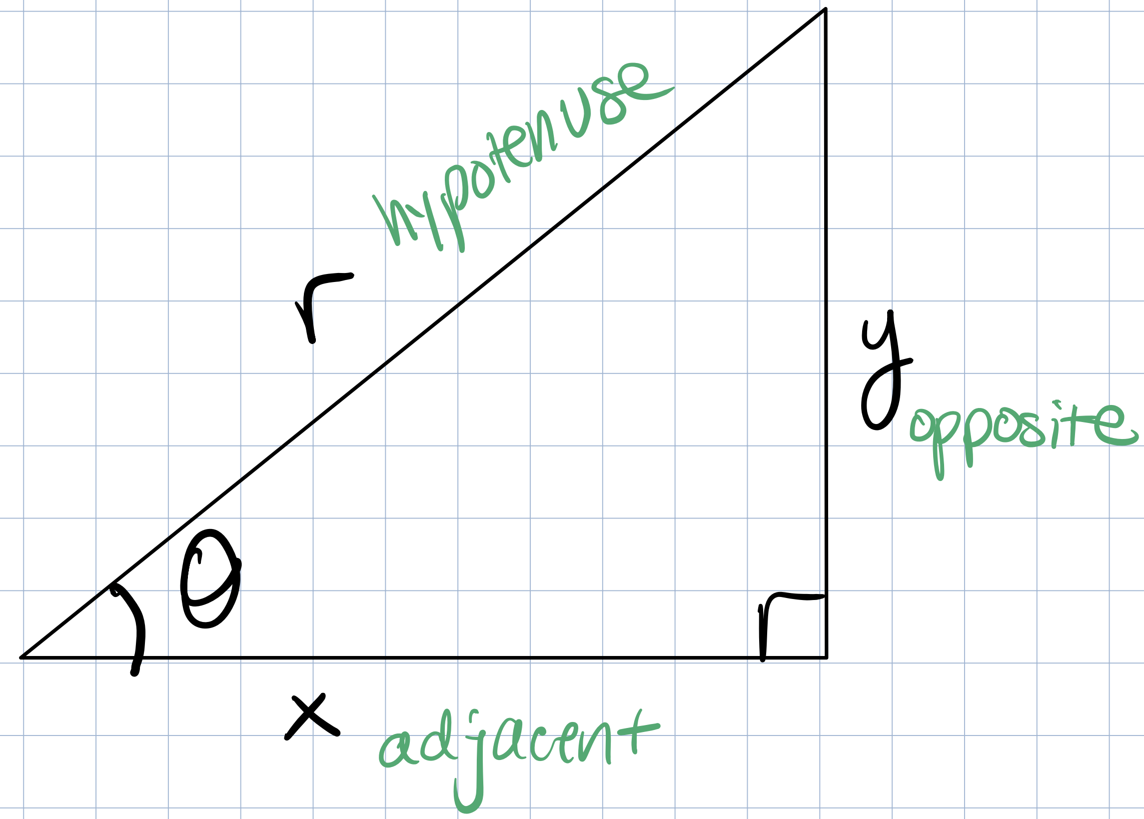
$$\boxed{x^2+y^2=r^2}$$

Def

Trigonometry is the study of triangles

we have 6 trigonometric functions that are defined as a function of θ, and the ratio of two sides.

1. sine
2. cosine
3. tangent
4. cosecant
5. secant
6. cotangent



1. $\boxed{\sin(\theta) = \frac{y}{r}}$

2. $\boxed{\cos(\theta) = \frac{x}{r}}$

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

③ $$\boxed{\tan(\theta) = \frac{y}{x}}$$

④ $$\csc(\theta) = \frac{1}{\sin(\theta)}$$

⑤ $$\sec(\theta) = \frac{1}{\cos(\theta)}$$

$$\boxed{\csc(\theta) = \frac{r}{y}}$$

$$\boxed{\sec(\theta) = \frac{r}{x}}$$

⑥ $$\cot(\theta) = \frac{1}{\tan(\theta)}$$

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

$$\boxed{\cot(\theta) = \frac{x}{y}}$$

<u>Generally</u>

$S\frac{O}{H}$ $C\frac{A}{H}$ $T\frac{O}{A}$

Sine $S\frac{O}{H}$ $\sin(\theta) = \frac{\text{opposite}}{\text{hypotenuse}}$

cosine $C\frac{A}{H}$ $\cos(\theta) = \frac{\text{adjacent}}{\text{hypotenuse}}$

tangent $T\frac{O}{A}$ $\tan(\theta) = \frac{\text{opposite}}{\text{adjacent}}$

Prove that

if $\sin(\theta) = \frac{y}{r}$ and $\cos(\theta) = \frac{x}{r}$,

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

<u>Proof</u>

Given that $\sin(\theta) = \frac{y}{r}$,

$\Rightarrow r \cdot \sin(\theta) = y$

Given that $\cos(\theta) = x/r$

$$\Rightarrow \quad r\cdot\cos(\theta) = x$$

$$x^2 + y^2 = r^2,$$

$\cos^2(\theta) = \cos(\theta)\cdot\cos(\theta)$

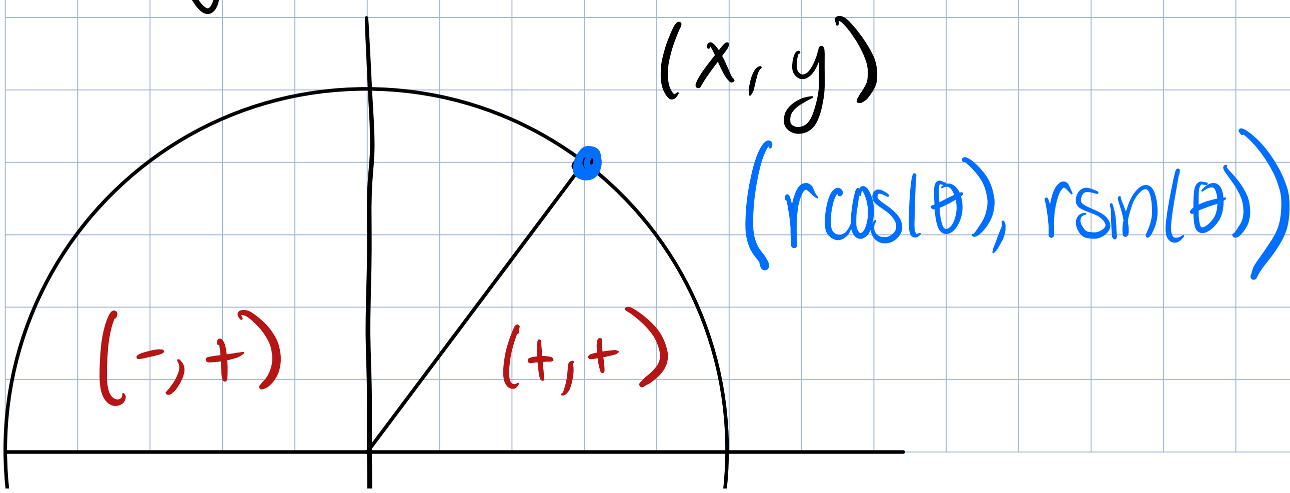
$$x = r\cdot\cos(\theta) \qquad y = r\cdot\sin(\theta)$$

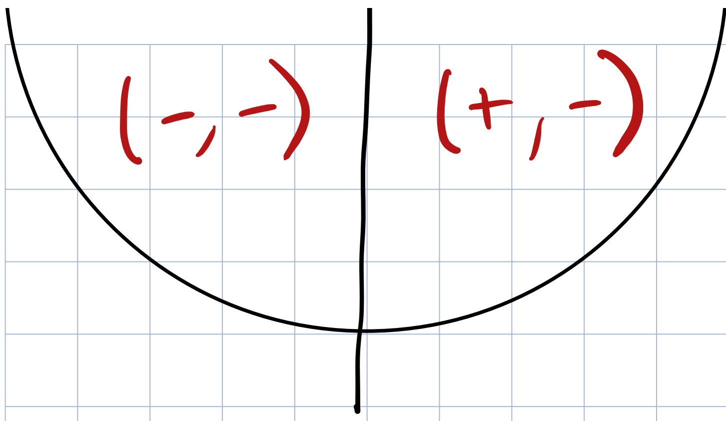
$$(r\cdot\cos(\theta))^2 + (r\cdot\sin\theta)^2 = r^2$$

$$\frac{r^2\cdot\cos^2(\theta) + r^2\cdot\sin^2(\theta)}{r^2} = \frac{r^2}{r^2}$$

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

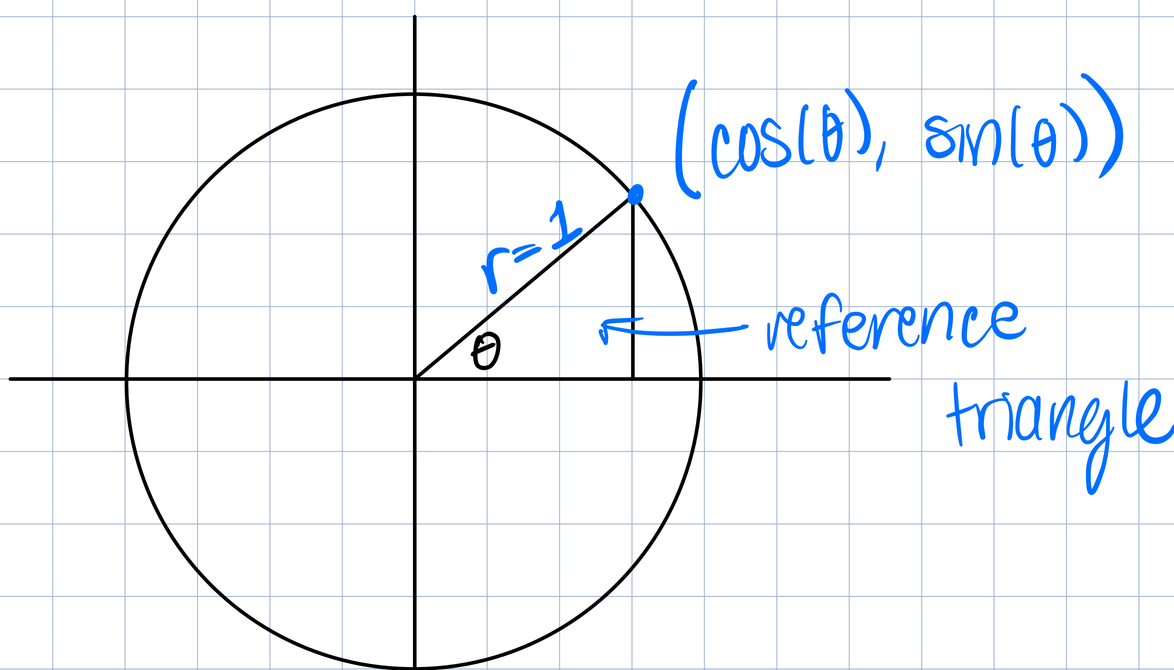
$$y = r\cdot\sin(\theta) \qquad x = r\cdot\cos(\theta)$$



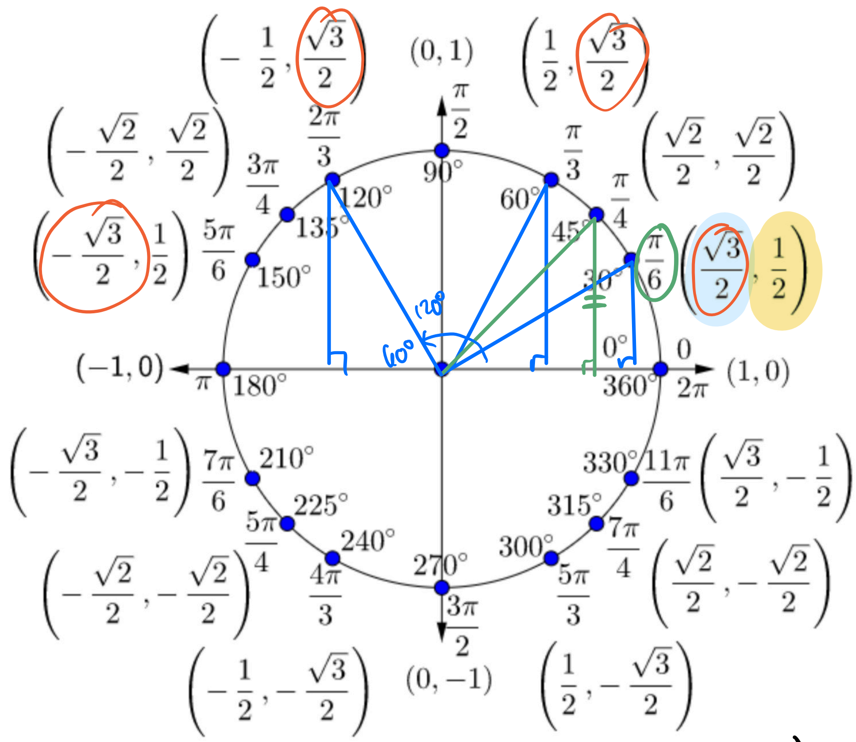


A circle w/a radius of 1,

↳ unit circle.

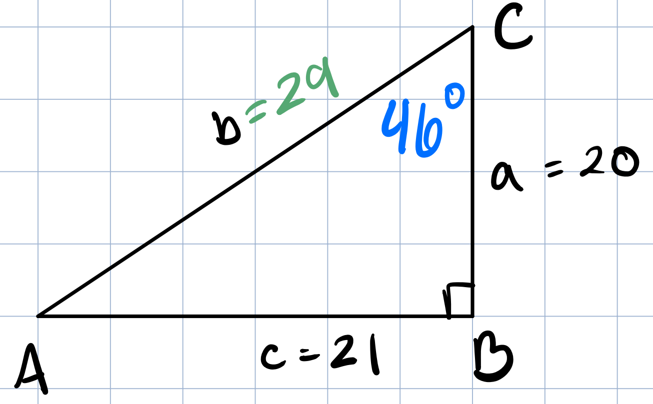


$(\cos(\theta), \sin(\theta))$



$\sin(90° - \theta) = \cos(\theta)$

- what do you notice?
- what patterns do you see?
- similarities and differences between quadrants?

① 

Side b

pythagorean thm.

$$20^2 + 21^2 = b^2$$

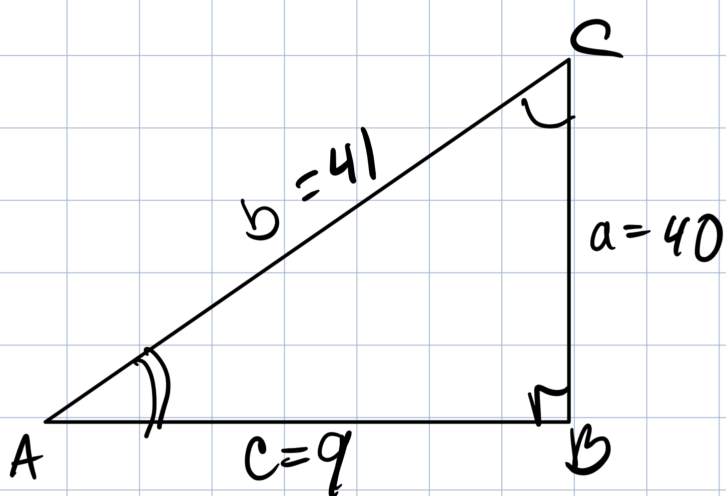
$$b = 29$$

$$\cos^{-1}(\cos(C)) = \cos^{-1}\left(\frac{20}{29}\right) \Rightarrow C^\circ = \cos^{-1}\left(\frac{20}{29}\right)$$

$$C^\circ \approx 46^\circ$$

$$A^\circ = 44^\circ$$

3



$$b = 41$$

$$\sin(A) = \frac{40}{41}$$

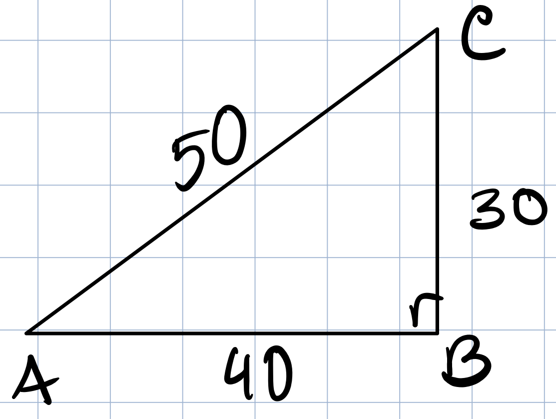
$$\cos(A) = \frac{9}{41}$$

$\cos(C) = \frac{40}{41}$ $\sin(C) = \frac{9}{41}$

$30° - 60° - 90°$

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

4



$b = 50$

$\sin(A) = \frac{3}{5}$ $\cos(A) = \frac{4}{5}$

$\tan(A) = \frac{3}{4}$

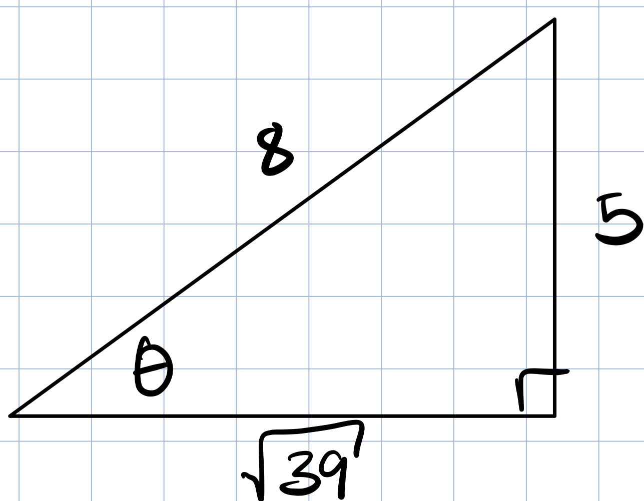
$\sin(C) = \frac{4}{5}$

$C = \sin^{-1}\left(\frac{4}{5}\right)$

$\boxed{C = 53°}$

$\boxed{A = 37°}$

5



$\sin(\theta) = \frac{5}{8}$ $\cos(\theta) = \frac{\sqrt{39}}{8}$

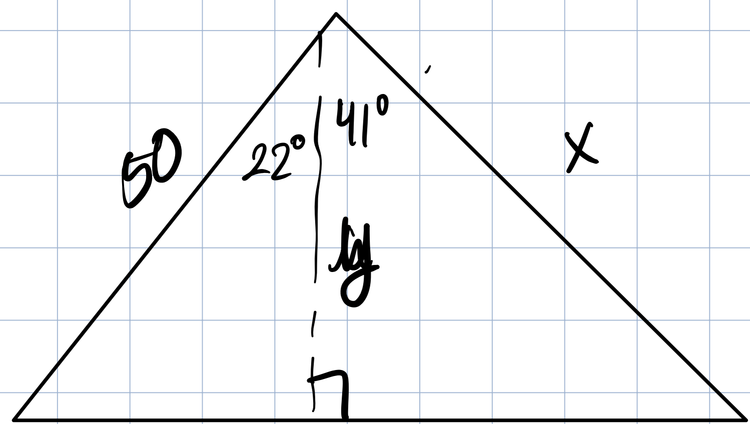
$\tan(\theta) = \frac{5}{\sqrt{39}} = \frac{5\sqrt{39}}{39}$

$\csc(\theta) = 8/5$ $\sec(\theta) = 8/\sqrt{39}$

$\cot(\theta) = \frac{\sqrt{39}}{5}$

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

6



$\cos(22^\circ) = \frac{y}{50}$

$50 \cdot \cos(22^\circ) = y$